ThinkServer RD120 Types 6444, 6445, 6446, and 6447

User Guide

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Note:

Before using this information and the product it supports, read the general information in “Notices,” on page 91, and the *Warranty and Support Information* document on the *ThinkServer Documentation* DVD.

Fourth Edition (April 2009)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information (安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document, which is provided on the *ThinkServer Documentation* DVD.

For example, if a caution statement is labeled “Statement 1,” translations for that caution statement are in the *Safety Information* document under “Statement 1.”

Be sure to read all caution and danger statements in this document before you perform the procedures. Read any additional safety information that comes with any optional device before you install the device.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	**To Disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 2:

CAUTION:
When replacing the lithium battery, use only the battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Statement 3:

CAUTION:
When laser products (such as CD drives, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

Statement 4:

≥ 18 kg (39.7 lb)

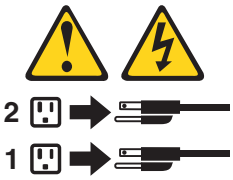
≥ 32 kg (70.5 lb)

≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 12:

CAUTION:
The following label indicates a hot surface nearby.

Statement 13:

DANGER

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.

Statement 15:

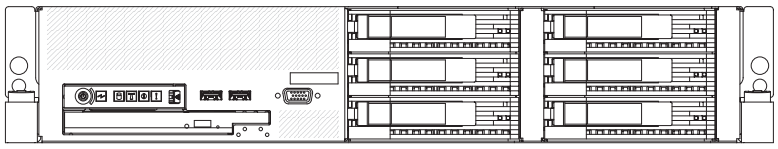
CAUTION:
Make sure that the rack is secured properly to avoid tipping when the server unit is extended.

Chapter 1. The ThinkServer RD120 server

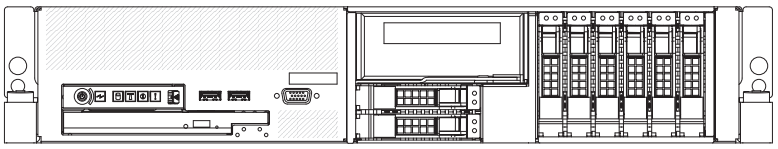
The Lenovo® ThinkServer™ RD120 (Machine Types 6444, 6445, 6446, and 6447) server is a 5-U-high, high-performance server. It is ideally suited for networking environments that require superior microprocessor performance, improved systems management, and flexible memory and data management.

The server has two model styles, which are based on the size and number of hard disk drive bays:

- The *3.5-inch* models have six 3.5-inch hot-swap hard disk drive bays. Install only 3.5-inch drives in these models. If you intend to install an optional tape drive, the tape drive will occupy two of the six 3.5-inch drive bays.



- The *2.5-inch* models have eight 2.5-inch hot-swap hard disk drive bays and one 3.5-inch tape-drive bay. Install only 2.5-inch hard disk drives and an optional 3.5-inch tape drive in these models.



Throughout this documentation, the terms *2.5-inch models* and *3.5-inch models* will be used to distinguish between the server styles.

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of the server. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

The server comes with a limited warranty. For information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document.

You can obtain up-to-date information about the server and other Lenovo server products at: http://www.lenovo.com/thinkserver.

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

1. Racks are measured in vertical increments of 4.45 cm (1.75 inches) each. Each increment is called a ″U.″ A 1-U-high device is 1.75 inches tall.

Related documentation

This *User Guide* contains general information about the server, including how to install supported optional devices and how to configure the server. The following documentation also comes with the server:

- *Installation Guide*

  This document is in Portable Document Format (PDF) on the *ThinkServer Documentation* DVD. It contains instructions for setting up the server and basic instructions for installing some optional devices.
- *Warranty and Support Information*

  This document is in PDF on the *ThinkServer Documentation* DVD. It contains information about the terms of the warranty and getting service and assistance.
- *Safety Information*

  This document is in PDF on the *ThinkServer Documentation* DVD. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.
- *Rack Installation Instructions*

  This document is in PDF on the *ThinkServer Documentation* DVD. It contains instructions for installing the server in a rack.
- *Hardware Maintenance Manual*

  This document is available in English as a PDF on the *ThinkServer Documentation* DVD. The most current version of the *Hardware Maintenance Manual* is available on the Lenovo Support Web site. It contains information to help you solve problems yourself, and it contains information for service technicians.

Depending on the server model, additional documentation might be included on the *ThinkServer Documentation* DVD.

The server might have features that are not described in the documentation that comes with the server. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. These updates are available from the Lenovo Web site. To check for updated documentation and technical updates, complete the following steps.

Note: Changes are made periodically to the Lenovo Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to: http://www.lenovo.com/support.
2. Enter your product number (machine type and model number) or select **Servers and Storage** from the **Select your product** list.
3. From **Family** list, select **ThinkServer RD120**, and click **Continue**.

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the *ThinkServer Documentation* DVD. Each statement is numbered for reference so you can locate the corresponding statement in your language in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following information is a summary of the features and specifications of the server. Depending on the server model, some features might not be available, or some specifications might not apply.

Racks are marked in vertical increments of 4.45 cm (1.75 inches). Each increment is referred to as a unit, or "U." A 1-U-high device is 1.75 inches tall.

Notes:

1. Power consumption and heat output vary depending on the number and type of optional features that are installed and the power-management optional features that are in use.
2. The sound levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

Table 1. Features and specifications

Microprocessor:
- Intel® Xeon® FC-LGA 771 dual-core with 4 MB Level-2 cache or quad-core with 8 MB (2x4 MB) Level-2 cache
- Support for up to two microprocessors
- Support for Intel Extended Memory 64 Technology (EM64T)

Notes:

1. Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors.
2. For a list of supported microprocessors, go to http://www.lenovo.com/thinkserver.

Memory:
- Twelve DIMM connectors
- Minimum: 1 GB
- Maximum: 48 GB
- Type: Fully buffered DIMM (FBD) PC2-5300 DIMMS only
- Sizes: 1 GB, 2 GB, or 4 GB (when available), in pairs
- Advanced ECC supported

Drives: CD/DVD: IDE 24x CD-RW/ 8x DVD combination

Expansion bays:
- Hot-swap hard disk drive bays: SAS only. Number and size depend on the server model. One of the following configurations:
  - Six 3.5-inch drive bays
  - Eight 2.5-inch drive bays
  - One 5.25-inch Ultrabay™ Enhanced bay (CD-RW/DVD drive installed)

Expansion slots :
- Two PCI Express x8 slots (x4 lanes) on system board (low profile)
- Support for either of the following optional riser cards:
  - Riser cards with two PCI Express x8 slots (x8 lanes) (standard)
  - Riser card with two 133 MHz/64-bit PCI-X slots

Hot-swap fans:
- Standard: Five
- Maximum: Ten - provide redundant cooling

Hot-swap power supplies: 835 watts (100 - 240 V ac):
- Minimum: One
- Maximum: Two - provide redundant power

Size (2U):
- Height: 85.4 mm (3.36 in.)
- Depth: 705 mm (27.8 in.)
- Width: 443.6 mm (17.5 in.)
- Weight: 21.09 kg (46.5 lb) to 29.03 kg (64 lb) depending upon configuration

Integrated functions:
- Baseboard management controller (BMC)
- Two Broadcom 10/100/1000 Ethernet controllers with TCP/IP Offload Engine (TOE) support
- One RAID controller, active only when an 8k or 8k-l SAS controller is installed
- One serial port
- One serial-attached SCSI (SAS) controller
- Seven Universal Serial Bus (USB) ports (two on front and four on rear, plus one internal), v2.0 supporting v1.1
- Two video ports (one on front and one on rear of server)
- One internal serial AGA (SATA) connector
- Support for Remote Supervisor Adapter II SlimLine (option)

Note: In messages and documentation, the term *service processor* refers to the baseboard management controller or the optional Remote Supervisor Adapter II SlimLine.

Video controller:
- ATI RN50 video on system board
- Compatible with SVGA and VGA
- 16 MB DDR video memory

Acoustical noise emissions:
- Declared sound power, idle: 6.8 bel
- Declared sound power, operating: 6.8 bel

ServeRAID SAS controller:
- ServeRAID™-8k-l SAS Controller that supports RAID levels 0, 1, 10
- Upgradeable to ServeRAID-8k SAS Controller, 256 MB with battery backup, that supports RAID levels 0, 1, 1E, 5, 6, and 10

Environment:
- Air temperature:
  - Server on: 10° to 35°C (50° to 95°F) Altitude: 0 to 914.4 m (3000 ft)
  - Server off: 10° to 43°C (50° to 109.4°F) Maximum altitude: 2133.6 m (7000 ft)
  - Shipping: -40° to 60°C (-40° to 140°F)
- Humidity (operating and storage):
  - Server on: 8% to 80%
  - Server off: 8% to 80%

Heat output:
Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 1230 Btu per hour (360 watts)
- Maximum configuration: 3390 Btu per hour (835 watts)

Electrical input with hot-swap ac power supplies:
- Sine-wave input (50 or 60 Hz) required
- Input voltage and frequency ranges automatically selected
- Input voltage low range:
  - Minimum: 100 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 200 V ac
  - Maximum: 240 V ac
- Input kilovolt-amperes (kVA) approximately:
  - Minimum: 0.29 kVA (all models)
  - Maximum: 1.00 kVA

What your server offers

The server uses the following features and technologies:

- **Baseboard management controller**

  The baseboard management controller (BMC) provides basic service-processor environmental monitoring functions. If an environmental condition exceeds a

threshold or if a system component fails, the baseboard management controller lights LEDs to help you diagnose the problem.

- *ThinkServer EasyStartup* **DVD**

  The Lenovo *ThinkServer EasyStartup* DVD that comes with the server provides programs to help you set up the server and install an operating system. The EasyStartup™ program detects installed hardware devices and guides you through the process of creating a response file and performing an unattended installation of the operating system and associated device drivers.

  For more information about the *ThinkServer EasyStartup* DVD, refer to the *ThinkServer RD120 Installation Guide*.

- **EasyManage software**

  ThinkServer EasyManage software helps you maintain high performance while limiting downtime. Through a single console you can monitor and configure alerts for security and performance, perform hardware failure prediction, deploy operating systems and software, and monitor software licenses. You can download and install the EasyManage software from the Lenovo Support Web site (http://www.lenovo.com/support). For information about installing EasyManage software, refer to the *Installation Guide*.

- *Diagnostics* **CD**

  The *Diagnostics* CD provided with your server contains the diagnostic programs for testing the major components of the server. For additional information about the *Diagnostics* CD, see the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.

- **Integrated network support**

  The server comes with two integrated Broadcom Gigabit Ethernet controllers, which support connection to a 10-Mbps, 100-Mbps, or 1000-Mbps network. For more information, see “Configuring the Gigabit Ethernet controllers” on page 89.

- **Large data-storage and hot-swap capability**

  The 3.5-inch model server supports up to six slim, 3.5-inch hot-swap hard disk drives in the hot-swap bays. The 2.5-inch model server supports up to eight 2.5-inch hot-swap hard disk drives in the hot-swap bays. With the hot-swap feature, you can add, remove, or replace hard disk drives without turning off the server.

- **Easy LED Diagnostics**

  Easy LED Diagnostics provides LEDs to help you diagnose problems. For more information, see the section about Easy LED Diagnostics in the *Hardware Maintenance Manual*.
- **Memory mirroring**

  Memory mirroring improves the reliability of memory by writing information to the main memory and redundant locations in a mirrored pair of DIMMs.
- **Online-spare memory**

  Online-spare memory disables a failed pair of DIMMs from the system configuration and activates an online-spare DIMM pair to replace the failed pair.
- **PCI Express adapter capabilities**

  The server has two slots for low-profile PCI Express x4 adapters. These slots accept x8 adapters, but the adapters will operate as x4 adapters. The server also has two slots for PCI Express x8 adapters (on the riser card, full-height, one full-length and one half-length).

  Note: You can replace these PCI Express x8 slots with PCI-X 133 MHz slots by replacing the PCI Express riser-card assembly with an optional PCI-X riser-card assembly.
- **Redundant connection**

  The addition of an optional network interface card (NIC) provides a failover capability to a redundant Ethernet connection. If a problem occurs with the primary Ethernet connection, all Ethernet traffic that is associated with the primary connection is automatically switched to the redundant NIC. If the applicable device drivers are installed, this switching occurs without data loss and without user intervention.
- **Redundant cooling and power capabilities**

  The server supports up to 10 hot-swap fans, in multiples of 5, which provide redundant cooling. Redundant cooling enables continued operation if one of the fans fails. The server supports up to two 835-watt ac power supplies, which provide redundancy and hot-swap capability for a typical configuration. If the maximum load on the server is less than 835 watts and a problem occurs with one of the power supplies, the other power supply can meet the power requirements.

  Note: A 700-watt-48 volt dc power supply option may be available. The dc power supplies provide redundancy but no hot-swap capability.
- **RAID support**

  The server supports an internal ServeRAID-8k or 8k-l SAS Controller, which is required for you to use the hot-swap hard disk drives and to create redundant array of independent disks (RAID) configurations.

- **Systems-management capabilities**

  The server supports an optional IBM Remote Supervisor Adapter II SlimLine. When you use this adapter, you can manage the functions of the server locally and remotely. The Remote Supervisor Adapter II SlimLine also provides system monitoring, event recording, and dial-out alert capability.
- **TCP/IP offload engine (TOE) support**

  The Ethernet controllers in the server support TOE, which is a technology that offloads the TCP/IP flow from the microprocessors and I/O subsystem to increase the speed of the TCP/IP flow. When an operating system that supports TOE is running on the server and TOE is enabled, the server supports TOE operation. See the operating-system documentation for information about enabling TOE.

  Note: As of the date of this document, the Linux operating system does not support TOE.

Reliability, availability, and serviceability features

Three important computer design features are reliability, availability, and serviceability (RAS). The RAS features help to ensure the integrity of the data that is stored in the server, the availability of the server when you need it, and the ease with which you can diagnose and repair problems.

The server has the following RAS features:
- Automatic error retry and recovery
- Automatic restart after a power failure
- Backup basic input/output system (BIOS) switching under the control of the baseboard management controller
- Baseboard management controller (service processor)
- Built-in monitoring for fan, power, temperature, voltage, and power-supply redundancy
- Cable-presence detection on most connectors
- Advanced ECC memory protection
- Error codes and messages
- Error correcting code (ECC) L2 cache and system memory
- Fully-buffered DIMMs (FBD) support
- Hot-swap cooling fans with speed-sensing capability
- Hot-swap hard disk drives
- Hot-spare memory
- Information and diagnostics LED panels
- Memory mirroring
- Menu-driven setup, system configuration, and redundant array of independent disks (RAID) configuration programs
- Parity checking or CRC checking on the serially-attached SCSI (SAS) bus and PCI buses
- Power management: compliance with Advanced Configuration and Power Interface (ACPI)
- Power-on self-test (POST)
- Redundant Ethernet capabilities with failover support
- Redundant power supplies and redundant hot-swap fans (ac power supplies are hot-swap)
- Remind button to temporarily turn off the system-error LED
- Remote system problem-determination support
- Standby voltage for systems-management features and monitoring
- Startup (boot) from LAN through Preboot Execution Environment (PXE) boot agent utility or dynamic host configuration protocol/boot protocol (DHCP/BOOTP)

- System auto-configuring from the configuration menu
- System error logging (POST and service processor)
- Systems-management monitoring through the Inter-Integrated Circuit (I^2C) bus
- Upgradeable POST, BIOS, diagnostics, service processor microcode, and read-only memory (ROM) resident code, locally or over the LAN
- Vital product data (VPD) on microprocessors, system board, power supplies, SAS (hot-swap-drive) backplane, and power backplane

ThinkServer EasyStartup

The ThinkServer EasyStartup program simplifies the process of installing the operating system and device drivers on your server by performing the following tasks:

- Detects installed hardware devices
- Guides the network administrator through the process of creating a response file
- Enables the network administrator to create scripts or commands that run at the end of the installation process
- Facilitates the installation of the ThinkServer EasyManage products
- Prepares the hard disk for installation
- Prompts the network administrator to insert the operating-system installation disc
- Initiates an unattended installation of the operating system and device drivers

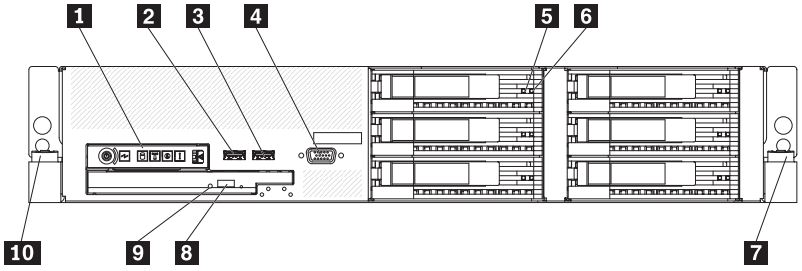
The EasyStartup program is provided with your server on DVD. The DVD is self starting (bootable). The User Guide for the EasyStartup program is on the DVD and can be accessed directly from the program's interface. For additional information, see the *ThinkServer RD120 Installation Guide*.

Server controls, LEDs, and power

This section describes the controls and light-emitting diodes (LEDs) and how to turn the server on and off.

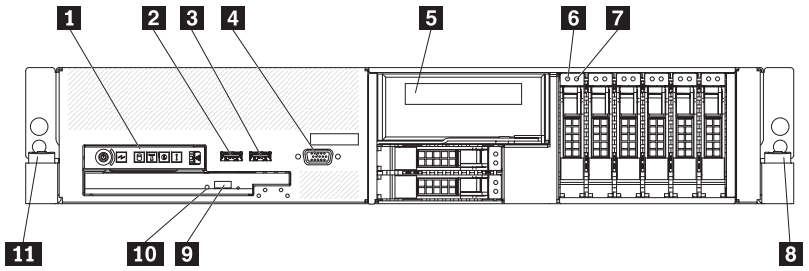
Front view

The following illustration shows the controls, light-emitting diodes (LEDs), and connectors on the front of the 3.5-inch model server.



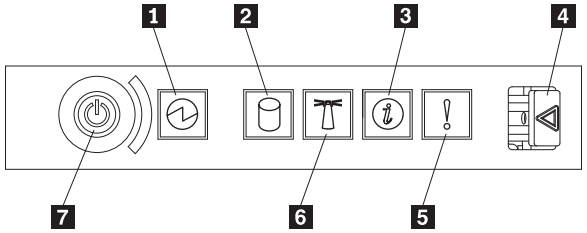
1	Operator information panel	6	Hard disk drive status LED (amber)
2	USB connector	7	Rack release latch
3	USB connector	8	CD/DVD eject button
4	Video connector	9	CD/DVD drive activity LED
5	Hard disk drive activity LED (green)	10	Rack release latch

The following illustration shows the controls, light-emitting diodes (LEDs), and connectors on the front of the 2.5-inch model server.



1	Operator information panel	7	Hard disk drive status LED (amber)
2	USB connector	8	Rack release latch
3	USB connector	9	CD/DVD eject button
4	Video connector	10	CD/DVD drive activity LED
5	Tape drive bay	11	Rack release latch
6	Hard disk drive activity LED (green)		

Operator information panel: This panel contains controls, LEDs, and connectors. The following illustration shows the controls, LEDs, and connectors on the operator information panel.



1	Power-on LED	5	System error LED
2	Hard disk drive activity LED	7	System locator LED
3	Information LED	7	Power-control button
4	Release latch		

The following controls, LEDs, and connectors are on the operator information panel:

- **Power-control button:** Press this button to turn the server on and off manually. A power-control-button shield comes installed on the server to prevent the server from being turned off accidentally.
- **Power-on LED:** When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to a power source. When this LED is off, it indicates that power is not present, or the power supply or the LED itself has failed.

  Note: If this LED is off, it does not mean that there is no electrical power in the server. The LED might be burned out. To remove all electrical power from the server, you must disconnect the power cord from the electrical outlet.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
- **Hard disk drive activity LED:** When this LED is flashing, it indicates that a hard disk drive is in use.
- **System-locator LED:** Use this LED to visually locate the server among other servers.

- **Information LED:** When this LED is lit, it indicates that a noncritical event has occurred. An LED on the diagnostics panel is also lit to help isolate the error.
- **System-error LED:** When this LED is lit, it indicates that a system error has occurred. An LED on the diagnostics panel is also lit to help isolate the error.
- **Release latch:** Slide this latch to the left to access the diagnostics panel, which is behind the operator information panel.

USB connectors: Connect a USB device, such as USB mouse, keyboard, or other USB device, to either of these connectors.

Video connector: Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

Hard disk drive activity LED: Each hot-swap hard disk drive has an activity LED. When this LED is flashing, it indicates that the drive is in use.

Hard disk drive status LED: Each hot-swap hard disk drive has a status LED. When this LED is lit, it indicates that the drive has failed. When this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt as part of a RAID configuration. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

CD/DVD-eject button: Press this button to release a CD or DVD from the CD-RW/DVD drive.

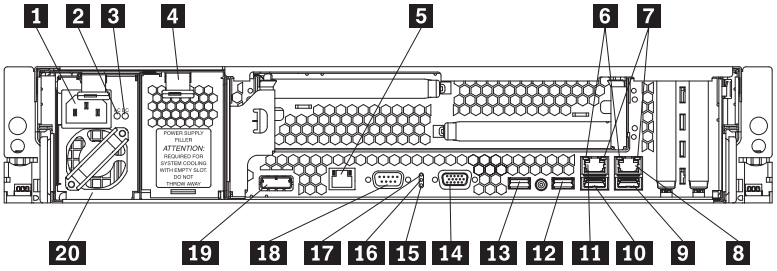
CD/DVD drive activity LED: When this LED is lit, it indicates that the CD-RW/DVD drive is in use.

Rack release latches: Press these latches to release the server from the rack.

Rear view

The following illustration shows the connectors and LEDs on the rear of the server.

Attention: In a dc power environment, see the documentation that comes with the dc power supply for information about the power-supply LEDs.



1	Power cord connector	11	Ethernet 2 connector
2	AC power LED	12	USB 2 connector
3	DC power LED	13	USB 1 connector
4	Power-supply filler panel	14	Video connector
5	Systems-management Ethernet connector	15	System error LED
6	Ethernet activity LEDs	16	System locator LED
7	Ethernet link LEDs	17	Power on LED
8	Ethernet connector 1	18	Serial connector
9	USB 4 connector	19	SAS connector

10 USB 3 connector

20 Power supply 1

Power-cord connector (ac power supply only): Connect the power cord to this connector.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

AC power LED: Each hot-swap power supply has an ac power LED and a dc power LED. When the ac power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.

DC power LED: Each hot-swap power supply has a dc power LED and an ac power LED. When the dc power LED is lit, it indicates that the power supply is supplying adequate dc power to the system. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.

Systems-management Ethernet connector: Use this connector to connect the server to a network for systems-management information control. This connector is active only if you have installed a Remote Supervisor Adapter II SlimLine, and it is used only by the Remote Supervisor Adapter II SlimLine.

Ethernet activity LEDs: When these LEDs are lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port.

Ethernet link LEDs: When these LEDs are lit, they indicate that there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.

Ethernet connectors: Use either of these connectors to connect the server to a network.

USB connectors: Connect a USB device, such as USB mouse, keyboard, or other USB device, to any of these connectors.

Video connector: Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

System-error LED: When this LED is lit, it indicates that a system error has occurred. An LED on the diagnostics panel is also lit to help isolate the error.

System-locator LED: Use this LED to visually locate the server among other servers.

Power-on LED: When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to a power source. When this LED is off, it indicates that power is not present, or the power supply or the LED itself has failed.

Serial connector: Connect a 9-pin serial device to this connector. The serial port is shared with the baseboard management controller (BMC). The BMC can take control of the shared serial port to perform text console redirection and to redirect serial traffic, using Serial over LAN (SOL).

SAS connector: Connect a serial-attached SCSI (SAS) device to this connector.

Server power features

When the server is connected to a power source but is not turned on, the operating system does not run, and all core logic except for the service processor (the baseboard management controller or optional Remote Supervisor Adapter II SlimLine) is shut down; however, the server can respond to requests from the service processor, such as a remote request to turn on the server. The power-on LED flashes to indicate that the server is connected to power but is not turned on.

Turning on the server

Approximately 5 seconds after the server is connected to power, the power-control button becomes active, and one or more fans might start running to provide cooling while the server is connected to power. You can turn on the server and start the operating system by pressing the power-control button.

The server also can be turned on in any of the following ways:

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.

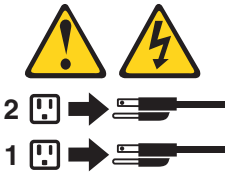
Turning off the server

When you turn off the server and leave it connected to power, the server can respond to requests from the service processor, such as a remote request to turn on the server. While the server remains connected to power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.

Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

The server can be turned off in any of the following ways:

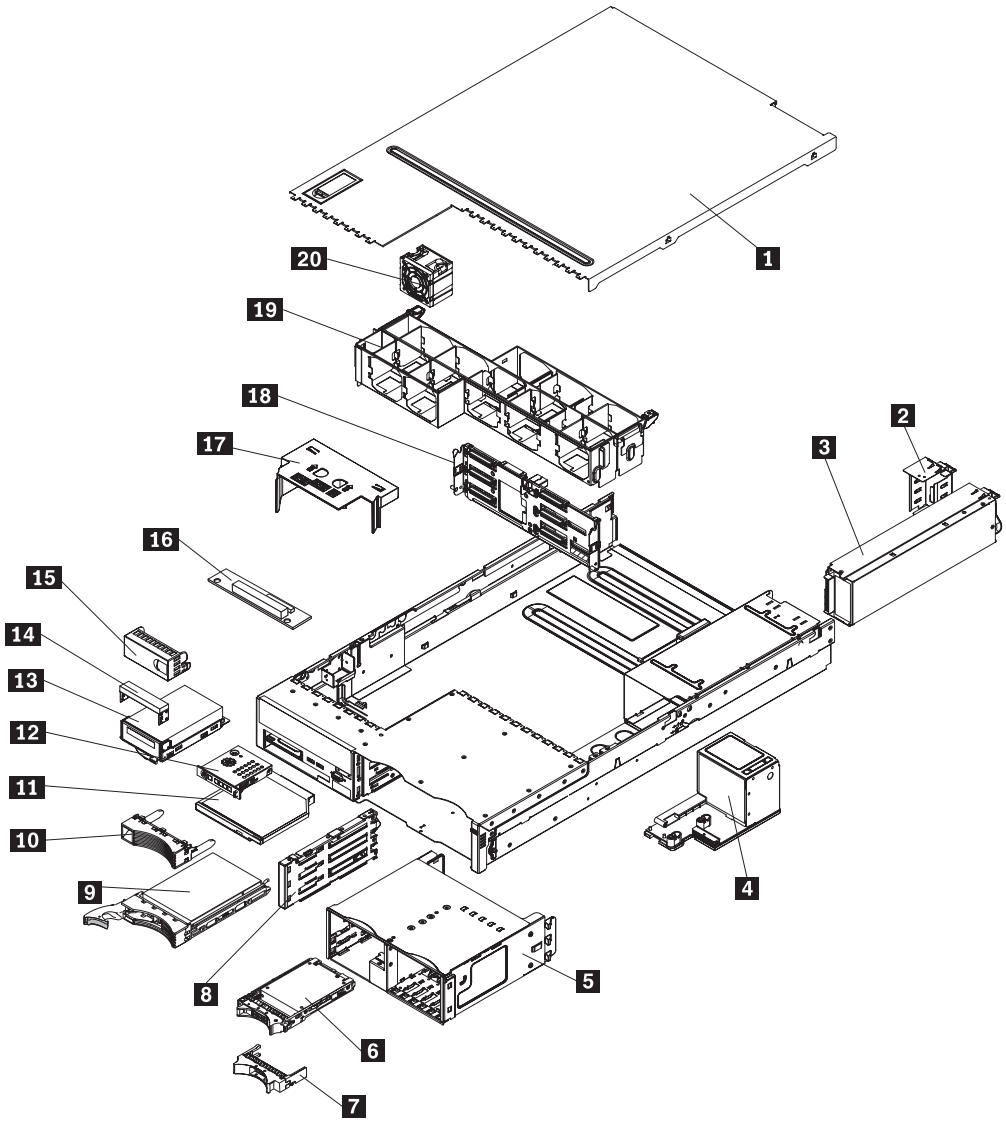
- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will be turned off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.
- The service processor can turn off the server as an automatic response to a critical system failure.
- You can turn off the server through a request from the service processor.

Chapter 2. Installing optional devices

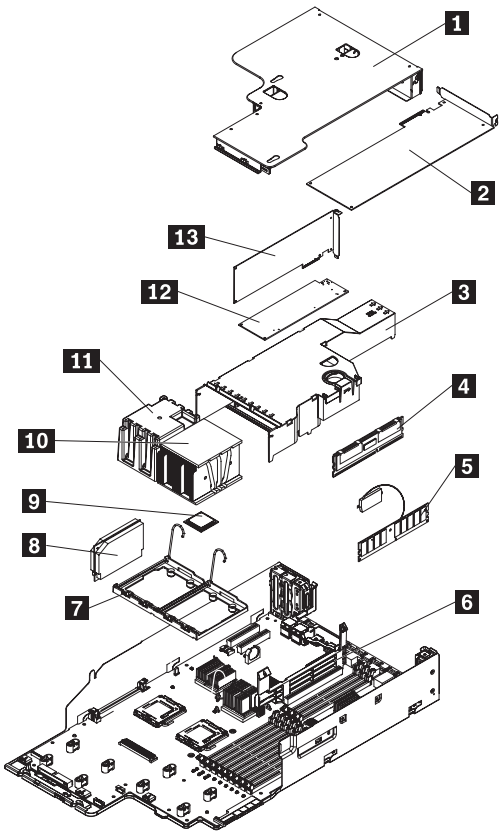
This chapter provides detailed instructions for installing optional hardware devices in the server.

Server components

The following illustrations show the major components in the server. The illustrations in this document might differ slightly from your hardware.



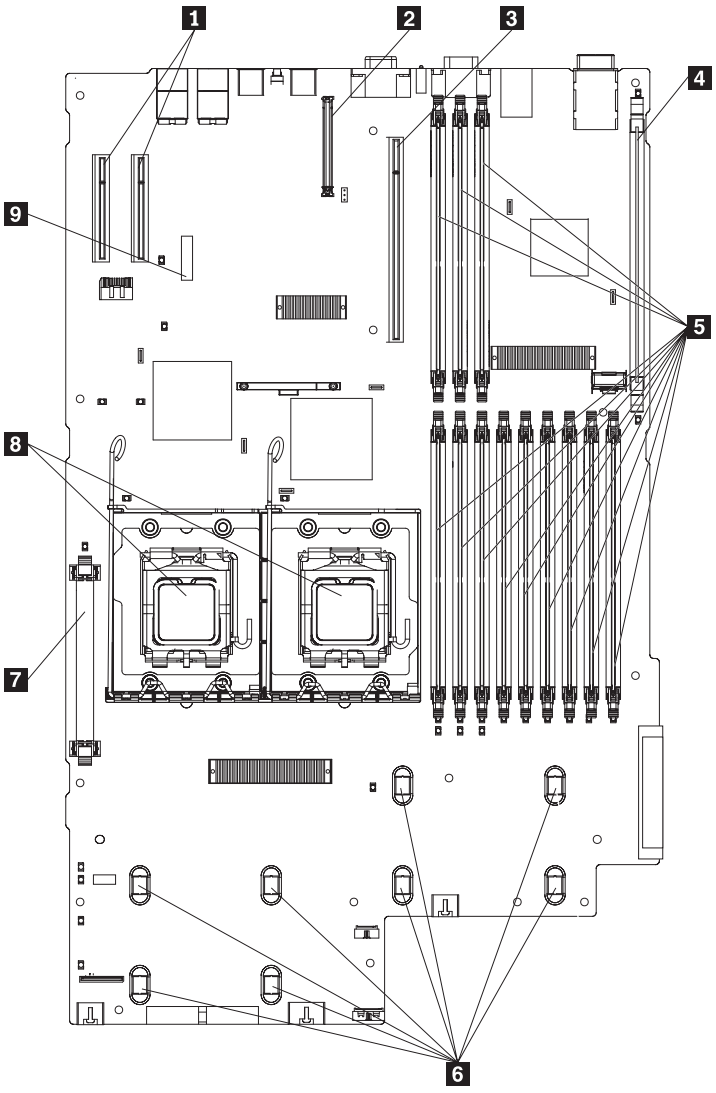
1	Cover	11	CD/DVD drive
2	Power-supply filler	12	Operator information panel
3	Power supply	13	Optional tape drive
4	Power backplane	14	Tape drive space filler
5	2.5-inch drive cage with hard disk drive backplane	15	Tape drive filler
6	2.5-inch hard disk drive	16	CD/DVD media backplane
7	2.5-inch filler panel	17	Microprocessor air baffle
8	3.5-inch cage divider	18	3.5-inch hard disk drive backplane
9	3.5-inch hard disk drive	19	Fan bracket assembly
10	3.5-inch filler panel	20	Fans (5 or 10)



1	Riser-card assembly	8	VRM
2	Full-height adapter	9	Microprocessor
3	DIMM air baffle	10	Heat sink
4	DIMM	11	Heat-sink filler
5	RAID SAS controller	12	Remote Supervisor Adapter II SlimLine
6	System board	13	Low-profile adapter
7	Heat-sink retention module		

System-board optional-device connectors

The following illustration shows the connectors on the system board for user-installable optional devices.



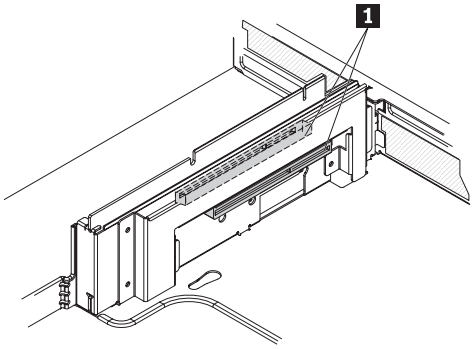
1	PCI Express slots 3 and 4	6	Fan connectors
2	Systems-management Ethernet connector	7	Voltage regulator module connector
3	PCI riser card connector	8	Microprocessor connectors (1 and 2)
4	RAID SAS connector	9	Battery connector
5	DIMM connectors (1-9)		

Note: The connectors for fans 7 and 10 are on the power backplane. See “Power-backplane-board connectors” on page 19.

PCI riser-card adapter connectors

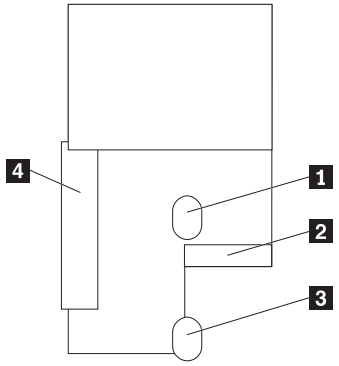
The following illustration shows the connectors **1** on the PCI riser card for user-installable PCI adapters.

Note: For clarity, in the following illustration the PCI riser-card assembly is inverted.



Power-backplane-board connectors

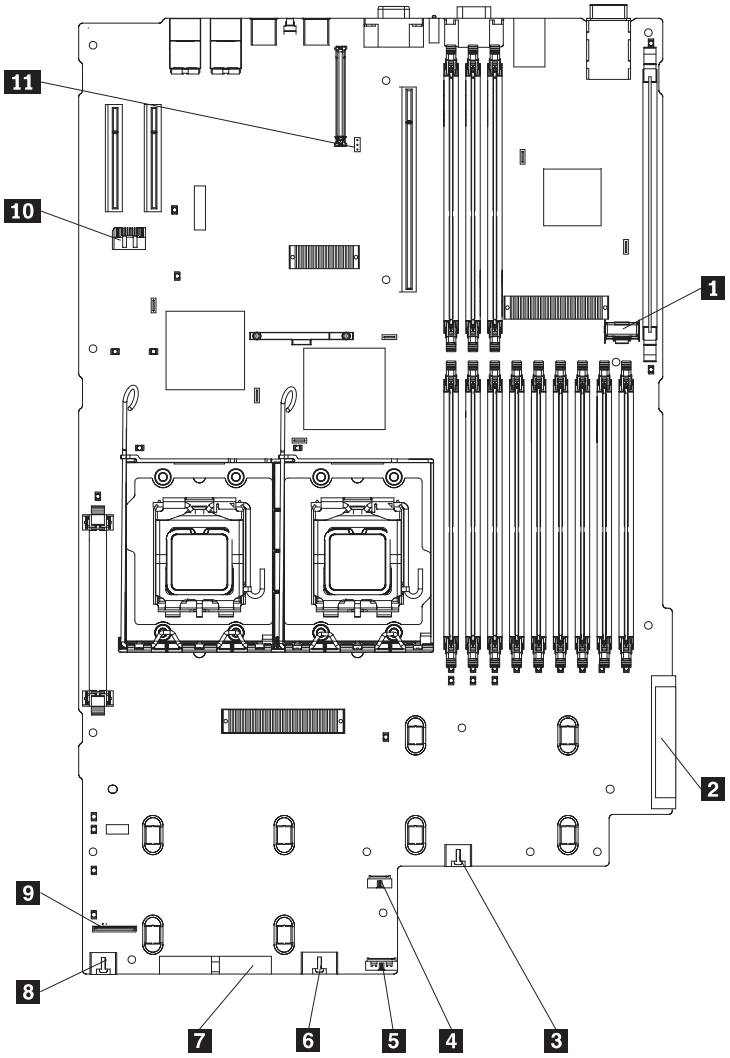
The following illustration shows the internal connectors on the power-backplane board.



1	Fan 10 connector
2	Hard disk drive power connector
3	Fan 7 connector
4	System board connector

System-board internal cable connectors

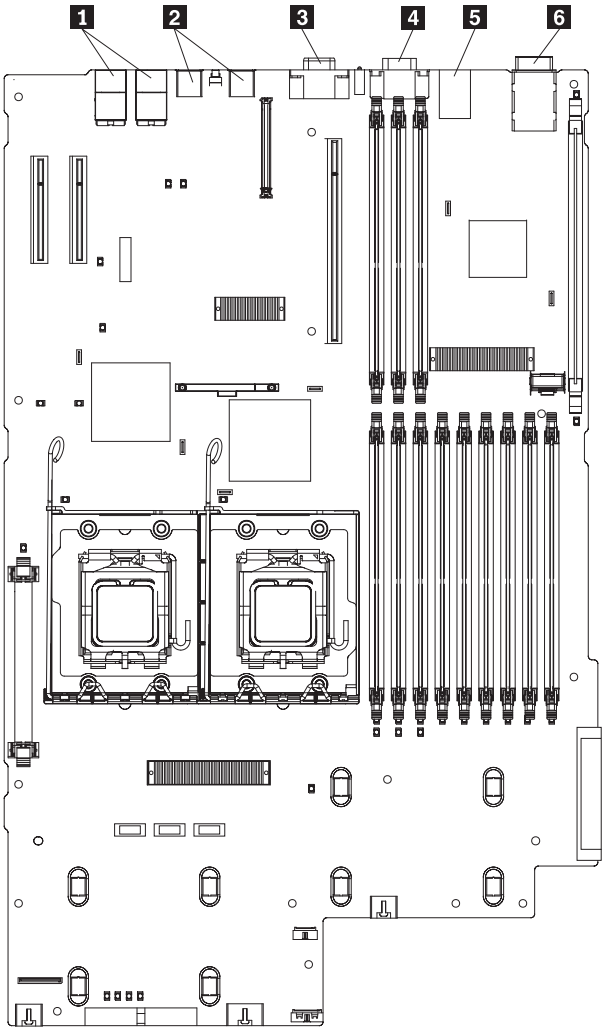
The following illustration shows the internal connectors on the system board.



1	Hard disk drive backplane signal (J92)	7	CD/DVD signal (J37)
2	Power backplane (J72)	8	CD/DVD power (J12)
3	Tape drive power (J100)	9	Operator information panel (J50)
4	Front USB (J80)	10	SATA tape drive signal (J102)
5	Front video (J51)	11	Intelligent Platform Management Bus (IPMB) connector
6	Internal USB (J82)		

System-board external connectors

The following illustration shows the external input/output connectors on the system board.

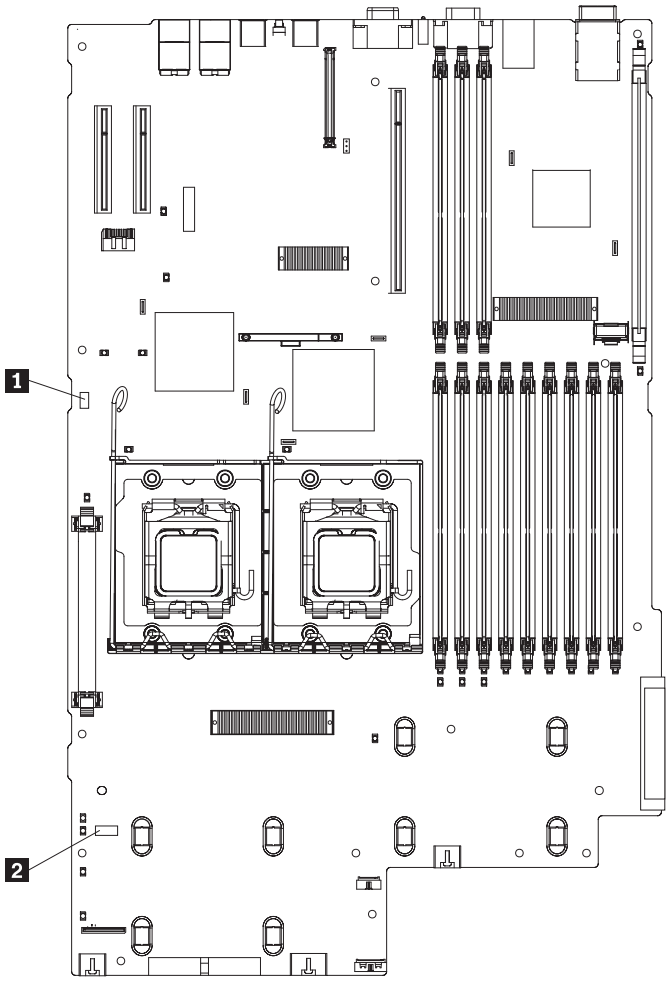


1	Ethernet connectors 1 and 2 and USB connectors 3 and 4	4	Serial connector
2	USB connectors 1 and 2	5	Systems-management Ethernet connector
3	Video connector	6	SAS connector

System-board switches and jumpers

The following illustration shows the switches and jumpers on the system board.

Any switches or jumpers on the system board that are not shown in the illustration are reserved. See the section about recovering the basic input/output system (BIOS) code in the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD for information about using the boot block recovery jumper.



1 Boot block recovery jumper (J42)
2 Switch block (SW2)

Table 2 on page 23 describes the function of each switch on the switch block.

Table 2. Switches 1 - 8

Switch number	Default value	Switch description
8	Off	Reserved.
7	Off	Reserved.
6	Off	Reserved.
5	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the server is turned on and starts the Configuration/Setup Utility program so that you can change or delete the power-on password. You do not have to move the switch back to the default position after the password is overridden. Changing the position of this switch does not affect the administrator password check if an administrator password is set. See “Passwords” on page 84 for additional information about the power-on password.
4	Off	Reserved.
3	Off	Reserved.
2	Off	Reserved.
1	Off	Clear CMOS. When this switch is toggled to On, it clears the CMOS data, which clears the power-on password.

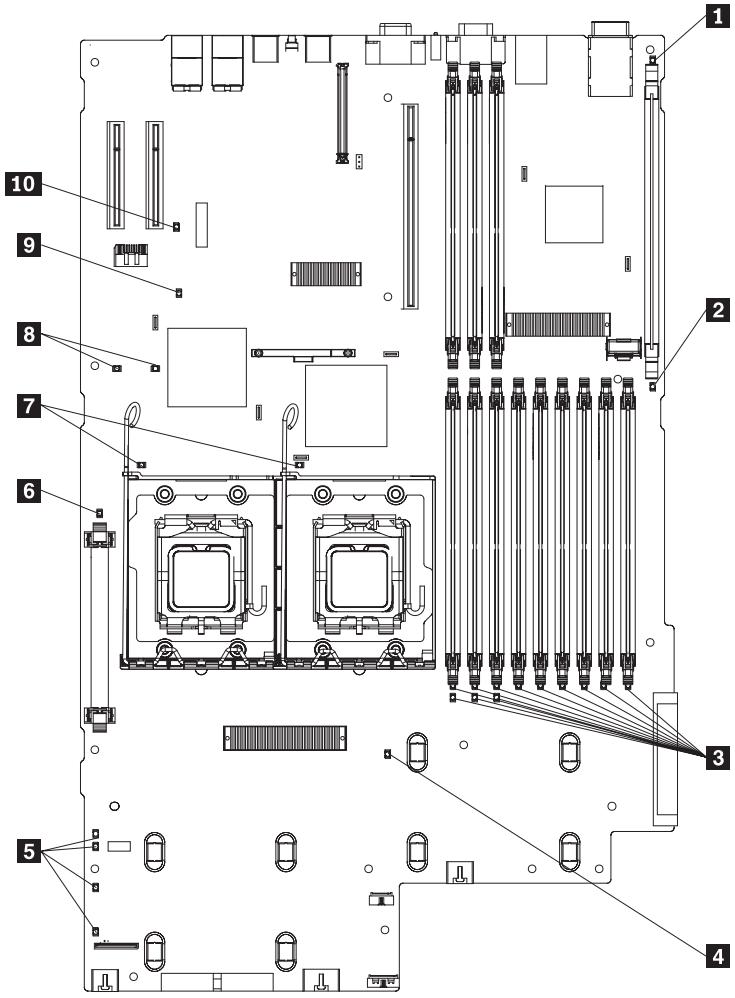
Important:

1. Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. (Review the information in “Safety” on page v, “Installation guidelines” on page 29, “Handling static-sensitive devices” on page 31, and “Turning off the server” on page 12.)

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
2. Any system-board switch or jumper blocks that are not shown in the illustrations in this document are reserved.

System-board LEDs

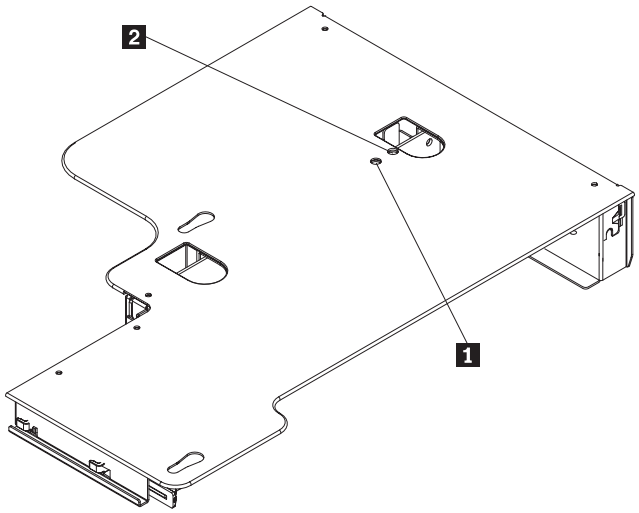
The following illustration shows the light-emitting diodes (LEDs) on the system board.



1	Riser-card-missing error LED	6	VRM error LED
2	RAID error LED	7	Microprocessors 1 and 2 error LEDs
3	DIMMs 1 - 12 error LEDs	8	PCI slots 3 and 4 error LEDs
4	BMC heartbeat LED	9	System-management Ethernet error LED
5	Power Channels A, B, C, D error LEDs	10	3-V battery error LED

Riser-card assembly LEDs

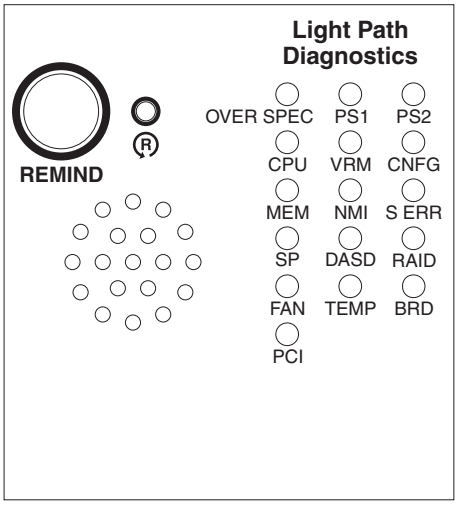
The following illustration shows the light-emitting diodes (LEDs) on the riser-card assembly.



1 PCI slot 1 error LED
2 PCI slot 2 error LED

Diagnostics panel

The following illustration shows the controls and LEDs on the diagnostics panel.



To access the diagnostics panel, slide the release latch on the front of the operator information panel to the left.

The following table lists the LEDs on the diagnostics panel and suggested actions to solve the detected problems.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

LED	Description	Action
None, but the system-error LED is lit.	An error has occurred and cannot be diagnosed, or the Advanced System Management (ASM) processor on the Remote Supervisor Adapter II SlimLine has failed. The error is not represented by a diagnostics LED.	Check the system-error log for information about the error.
OVER SPEC	The power supplies are using more power than their maximum rating.	1. Remove optional devices from the server. 2. Replace the failing power supply. **Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply.
PS 1	The power supply in bay 1 has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply. 1. Make sure that the power supply is correctly seated. 2. Replace the failed power supply.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the** *Hardware Maintenance Manual* **to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

LED	Description	Action
PS 2	The power supply in bay 2 has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply. 1. Make sure that the power supply is correctly seated. 2. Replace the failed power supply.
CPU	A microprocessor has failed.	1. Make sure that the failing microprocessor, which is indicated by a lit LED on the system board, is installed correctly. See "Installing a microprocessor" on page 54 for information about installing a microprocessor. 2. Make sure that a ServeRAID 8k or 8k-l SAS controller is installed and correctly seated. Make sure that the battery for the ServeRAID 8k SAS controller is installed correctly. 3. Call for service.
VRM	An error occurred on the microprocessor voltage regulator module (VRM).	1. Replace the VRM. 2. Call for service.
CNFG	A hardware configuration error has occurred.	1. Check the microprocessors that were just installed to make sure that they are compatible with each other and with the VRM (see "Installing a microprocessor" on page 54 for compatiblity requirements). 2. (Trained service technician only) Replace an incompatible microprocessor. 3. Check the system-error logs for information about the error. Replace any components that are indicated.
MEM	A memory error has occurred.	Replace the failing DIMM, which is indicated by the lit LED on the system board.
NMI	A machine check error has occurred.	Check the system-error log for information about the error.
S ERR	Reserved.	
SP	The service processor has failed.	**Attention:** In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 1. Remove power from the server; then, reconnect the server to power and restart the server. 2. Update the firmware on the BMC. 3. Call for service
DASD	A hard disk drive error has occurred.	1. Check the LEDs on the hard disk drives and replace the indicated drive. 2. Call for service.

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).**
- **If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.**

LED	Description	Action
RAID	A RAID controller error has occurred.	1. Make sure that a RAID controller is installed. **Note:** The server will not start without a RAID controller installed. 2. Check the system-error log for information about the error.
FAN	A fan has failed, is operating too slowly, or has been removed. The TEMP LED might also be lit.	Replace the failing fan, which is indicated by a lit LED on the fan itself.
TEMP	The system temperature has exceeded a threshold level. A failing fan can cause the TEMP LED to be lit.	1. Determine whether a fan has failed. If it has, replace it. 2. Make sure that the room temperature is not too high. See "Features and specifications" on page 3 for temperature information. 3. Make sure that the air vents are not blocked. 4. Call for service.
BRD	An error has occurred on the system board.	1. Check the LEDs on the system board to identify the component that is causing the error. 2. Check the system-error log for information about the error.
PCI	An error has occurred on a PCI bus or on the system board. An additional LED will be lit next to a failing PCI slot.	1. Check the LEDs on the PCI slots to identify the component that is causing the error. 2. Check the system-error log for information about the error. 3. If you cannot isolate the failing adapter through the LEDs and the information in the system-error log, remove one adapter at a time from the failing PCI bus, and restart the server after each adapter is removed. 4. Call for service.

For more information about diagnostics, see the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.

Installation guidelines

Before you install optional devices, read the following information:

- Read the safety information that begins on page v and the guidelines in "Handling static-sensitive devices" on page 31. This information will help you work safely.
- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. Or, to download updates from the Lenovo Support Web site, complete the following steps:
  1. Go to: http://www.lenovo.com/support.
  2. Enter your product number (machine type and model number) or select **Servers and Storage** from the **Select your product** list.
  3. From **Family** list, select **ThinkServer RD120**, and click **Continue**.
  4. Click **Downloads and drivers** to download firmware updates.
- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see "Solving problems" in the *Installation Guide* on the *ThinkServer Documentation* DVD for diagnostic information.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not have to turn off the server to install or replace hot-swap fans, redundant hot-swap ac power supplies, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before performing any steps that involve removing or installing adapter cables or non-hot-swap optional devices or components.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.

- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of Lenovo optional devices for the server, see http://www/.lenovo.com/thinkserver.

System reliability guidelines

To help ensure proper system cooling and system reliability, make sure that the following requirements are met:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has redundant power, each of the power-supply bays has a power supply installed in it.

  Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, replace the server cover before you turn on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not operate the server without the air baffles installed. Operating the server without the air baffles might cause the microprocessors to overheat.
- Microprocessor socket 2 always contains either a heat-sink filler or a microprocessor and heat sink.

Working inside the server with the power on

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to halt, which could result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.

The server supports hot-plug, hot-add, and hot-swap devices and is designed to operate safely while it is turned on and the cover is removed. Follow these guidelines when you work inside a server that is turned on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.

- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, that could fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

Attention: Static electricity can damage the server and other electronic devices. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Removing the cover

Important: Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Hardware Maintenance Manual* for diagnostic information.

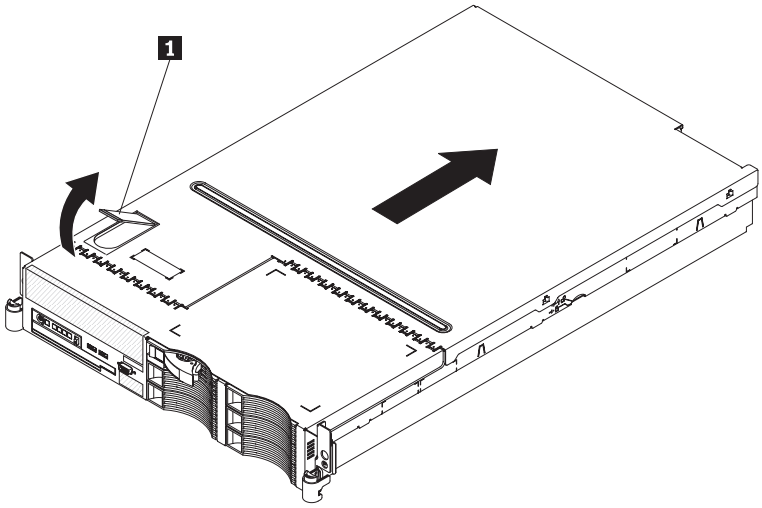
To remove the cover, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. If you are planning to install or remove a microprocessor, memory module, PCI adapter, battery, or other non-hot-swap optional device, turn off the server and all attached devices and disconnect all external cables and power cords (see “Turning off the server” on page 12).

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Press down on the left and right side latches and pull the server out of the rack enclosure until both slide rails lock.

   Note: You can reach the cables on the back of the server when the server is in the locked position.

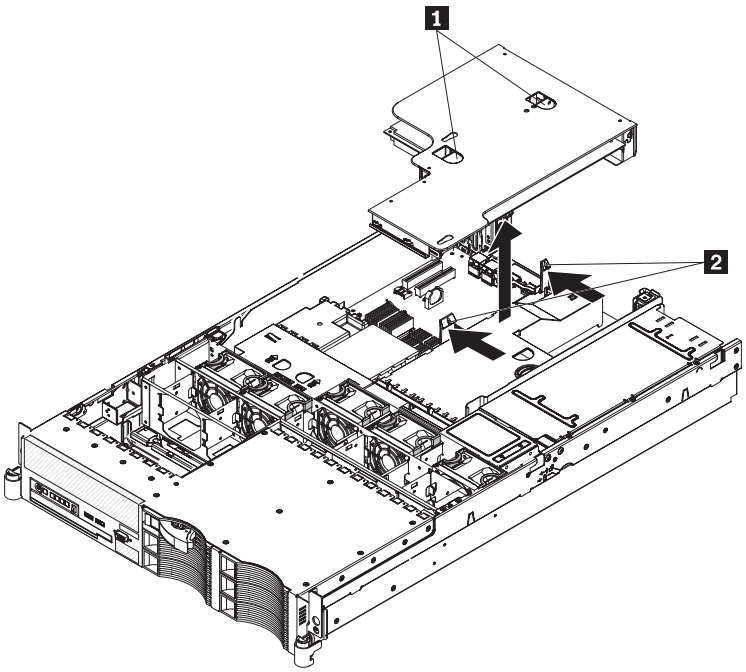
4. 

   Lift the cover-release latch **1** . Lift the cover off the server and set the cover aside.

Attention: For proper cooling and airflow, replace the cover before you turn on the server. Operating the server for extended periods of time (over 30 minutes) with the cover removed might damage server components.

Removing the riser-card assembly

The server comes with one riser-card assembly that contains two PCI Express x8 connectors. You can replace the PCI Express riser-card assembly with a PCI-X riser-card assembly, which contains two PCI-X 64-bit 133 MHz connectors. The PCI-X connectors support single-width IXA adapters. See http://www.lenovo.com/thinkserver/ for a list of riser-card assemblies that you can use with the server.



1 Access holes
2 Release tabs

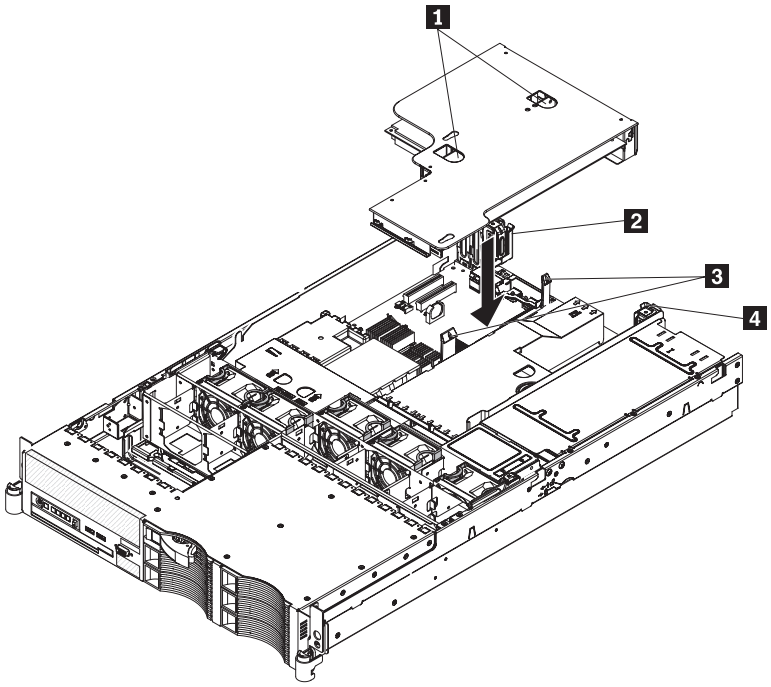
To remove the riser-card assembly, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Push the two riser-card-assembly release tabs toward the low-profile PCI slots; then, grasp the assembly at the rear and side edges and lift it to remove it from the server. Place the riser-card assembly on a flat, static-protective surface.

Installing the riser-card assembly

To install the riser-card assembly, complete the following steps.



1 Access holes
2 Guide
3 Release tabs
4 Guide

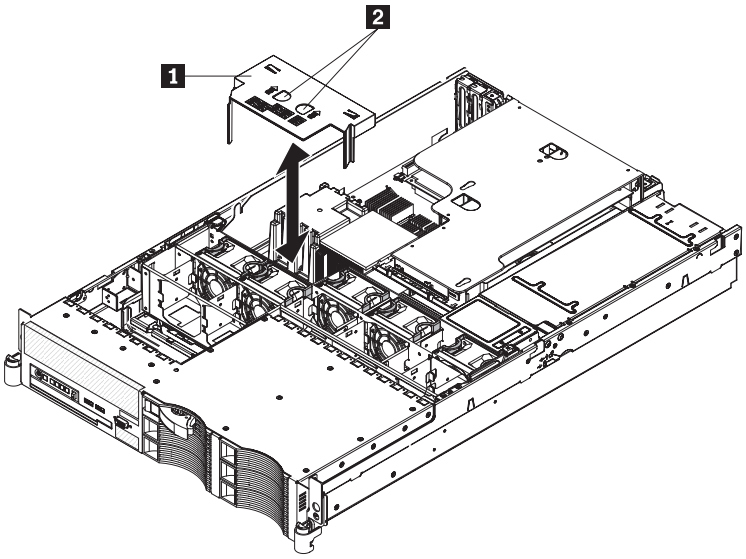
1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Make sure that the server and all peripheral devices are turned off and that the power cords and all external cables are disconnected.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Reinstall any adapters and reconnect any internal cables that you removed in other procedures.
4. Carefully align the riser-card assembly with the release tab posts, the guides on the rear of the server, and the riser-card connector on the system board; then, press down on the assembly. Make sure that the riser-card assembly is fully seated in the riser-card connector on the system board.

If you have other optional devices to install, do so now. Otherwise, go to “Completing the installation” on page 74.

Removing the microprocessor air baffle

When you work with some optional devices, you must first remove the microprocessor air baffle to access certain components or connectors on the system board. The following illustration shows how to remove the microprocessor air baffle.



1 Microprocessor air baffle
2 Finger holes

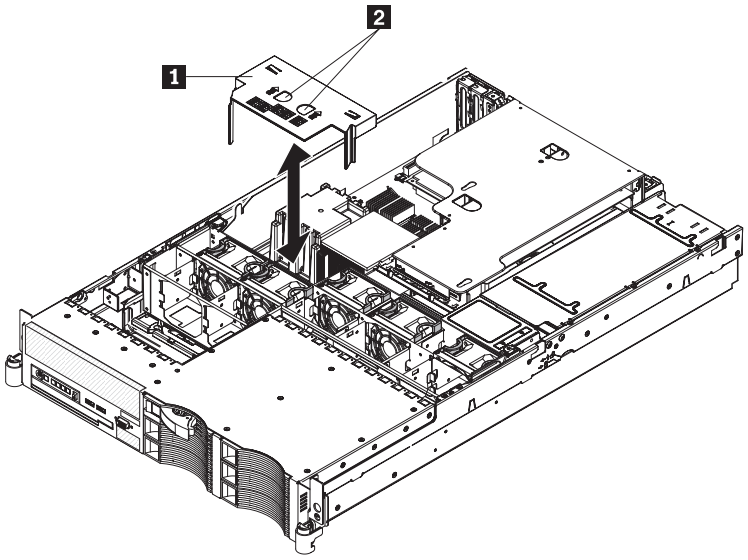
To remove the microprocessor air baffle, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 12).

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Place your fingers into the two finger holes on the top of the air baffle and lift the air baffle out of the server.

   Attention: For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with an air baffle removed might damage server components.

Installing the microprocessor air baffle



1	Microprocessor air baffle
2	Finger holes

To install the microprocessor air baffle, complete the following steps:

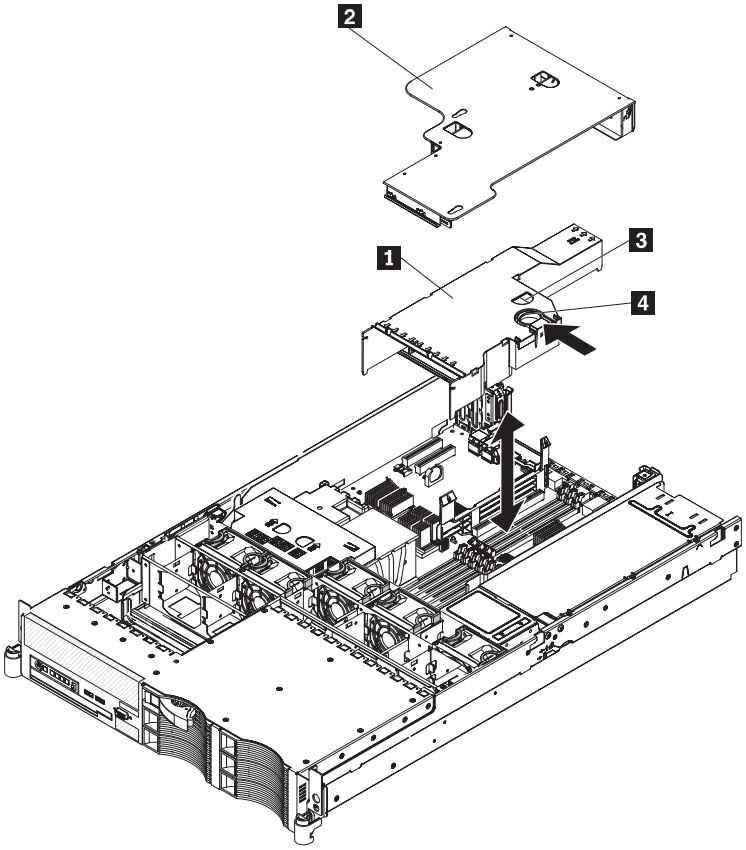
1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Make sure that the server and peripheral devices are turned off (see “Turning off the server” on page 12) and that all power cords and external cables are disconnected.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Place your fingers into the two finger holes on the top of the air baffle.
5. Align the tab on the left side of the air baffle with the slot in the left side of the chassis.
6. Lower the air baffle into the server.

   Attention: For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with an air baffle removed might damage server components.

Removing the DIMM air baffle

When you work with some optional devices, you must first remove the DIMM air baffle to access certain components or connectors on the system board. The following illustration shows how to remove the DIMM air baffle.



1	DIMM air baffle
2	Riser card assembly
3	Finger hole
4	Release ring

To remove the DIMM air baffle, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 12).

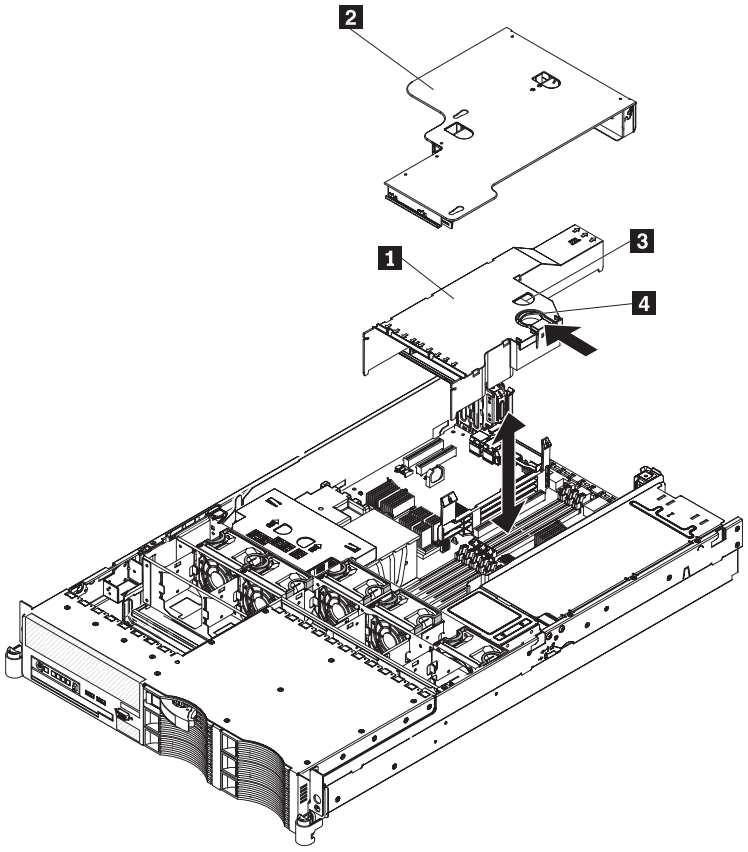
   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Remove the riser-card assembly (see “Removing the riser-card assembly” on page 32).
5. Place your fingers into the handle 4 and finger hole on the top of the air baffle.

6. Press the handle **4** toward the finger hole and lift the air baffle out of the server.

   Attention: For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with an air baffle removed might damage server components.

Installing the DIMM air baffle

The following illustration shows how to install the DIMM air baffle.



1	DIMM air baffle
2	Riser card assembly
3	Finger hole
4	Release ring

To install the DIMM air baffle, complete the following steps:

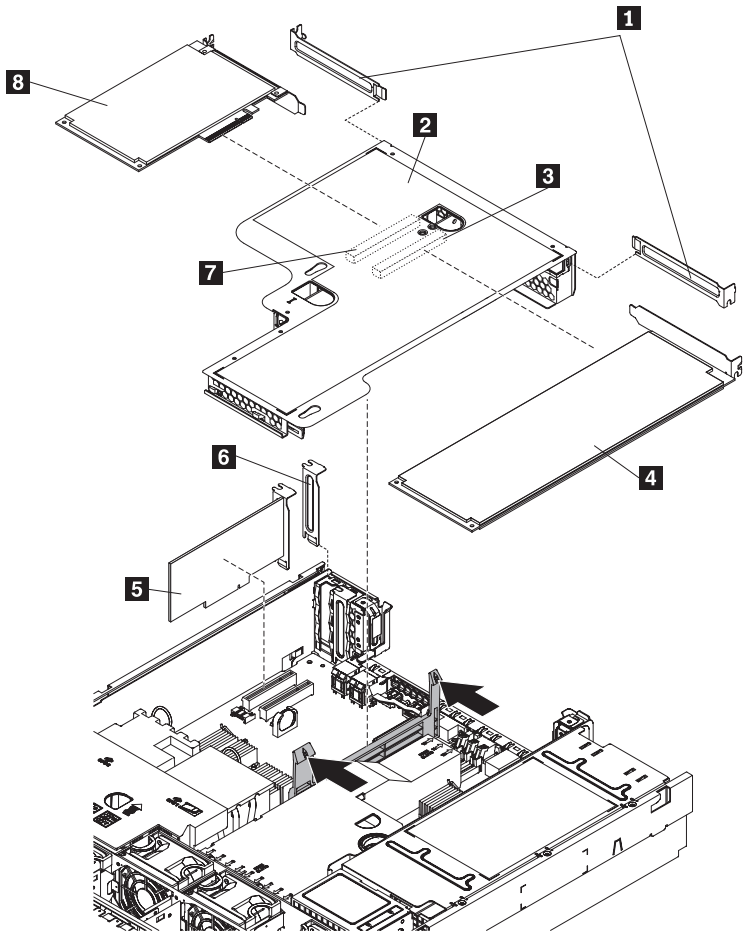
1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Make sure that the server and peripheral devices are turned off (see “Turning off the server” on page 12) and that all power cords and external cables are disconnected.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).

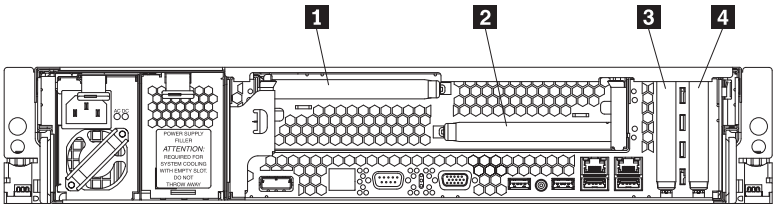
4. Align the tabs on the sides of the air baffle with the slots on the power-supply cage.
5. Place your fingers into the handle **4** and finger hole on the top of the DIMM air baffle.
6. Press the handle **4** toward the finger hole and lower the air baffle so that the lip on the right side of the baffle covers the lip on the side of the power-supply cage.
7. Press the DIMM air baffle into place.

Attention: For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with an air baffle removed might damage server components.

Installing an adapter



1	Expansion slot covers	**5**	Low profile PCI Express adapter
2	Riser-card assembly	**6**	Expansion slot cover
3	Expansion slot 1	**7**	Expansion slot 2
4	Adapter	**8**	Adapter



1 PCI slot 1
2 PCI slot 2
3 PCI slot 3
4 PCI slot 4

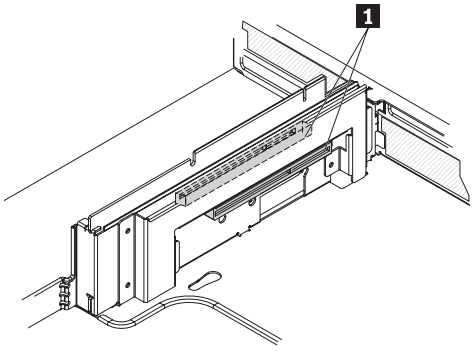
The following notes describe the types of adapters that the server supports and other information that you must consider when installing an adapter:

- You can install only low-profile adapters in PCI slots 3 and 4 on the system board.
- You can install a full-height, half-length adapter in slot 2 on the PCI riser card and a full-height, full-length adapter in slot 1 on the PCI riser card.
- An optional Remote Supervisor Adapter II SlimLine can be installed only in a dedicated slot on the system board.
- The server supports only 3.3 V and universal PCI adapters.
- The PCI bus configuration is as follows:
  - Non-hot-plug, low-profile PCI Express x8 (x4 lanes), slot 4
  - Non-hot-plug, low-profile PCI Express x8 (x4 lanes), slot 3
  - Non-hot-plug, half-length PCI Express x8 (x8 lanes), slot 2
  - Non-hot-plug, full-length PCI Express x8 (x8 lanes), slot 1
- The system scans devices in the following order, if you have not changed the default boot order: integrated Ethernet controllers, integrated SAS controller, and then PCI slots 1, 2, 3, and 4.

PCI riser card

The following illustration shows the location of the adapter expansion slots **1** on the PCI riser card.

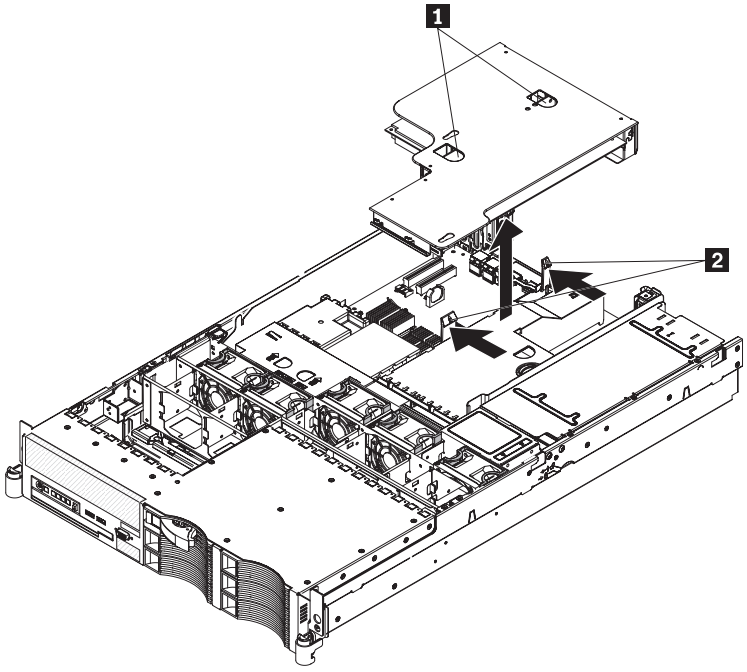
Note: For clarity, the riser-card assembly is inverted in the illustration.



To install an adapter, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 12).

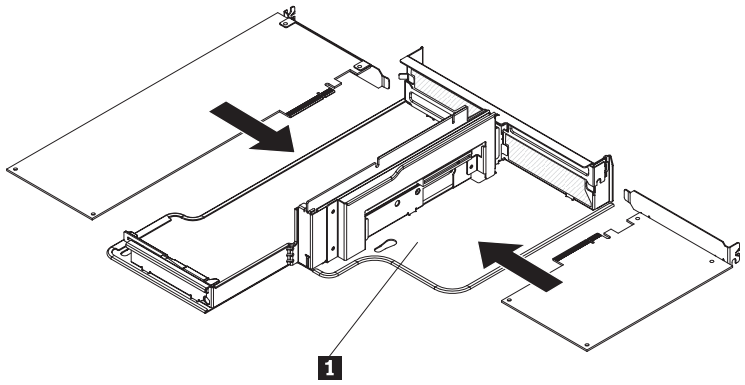
   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Determine which expansion slot you will use for the adapter.
5. If you are installing an adapter in PCI slot 1 or 2, remove the PCI riser-card assembly (see “Removing the riser-card assembly” on page 32).



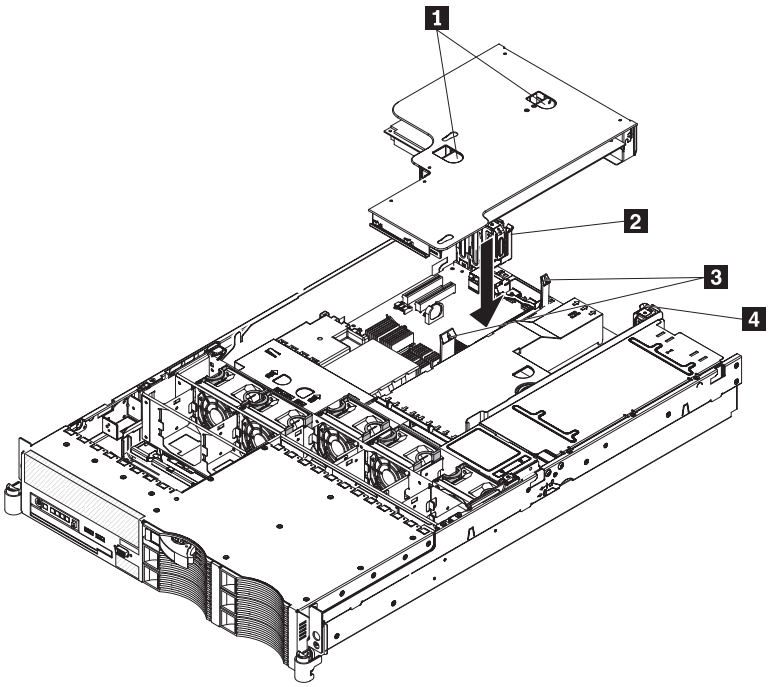
1 Access holes
2 Release tabs

6. Slide the expansion-slot cover out of the PCI low-profile expansion slot or PCI riser-card assembly expansion slot.
7. Install the adapter. The following illustration shows how to install an adapter in a PCI slot.

   Note: For clarity, the riser-card assembly 1 is shown inverted in the following illustration.



8. If you removed the PCI riser-card assembly to install the adapter, align the riser-card assembly with the release-tab posts, rear guides, and connector; then, press the PCI riser-card assembly *firmly* into the connector (see “Installing the riser-card assembly” on page 34).



1 Access holes
2 Guide
3 Release tabs
4 Guide

9. Connect any required cables to the adapter.

   Attention:

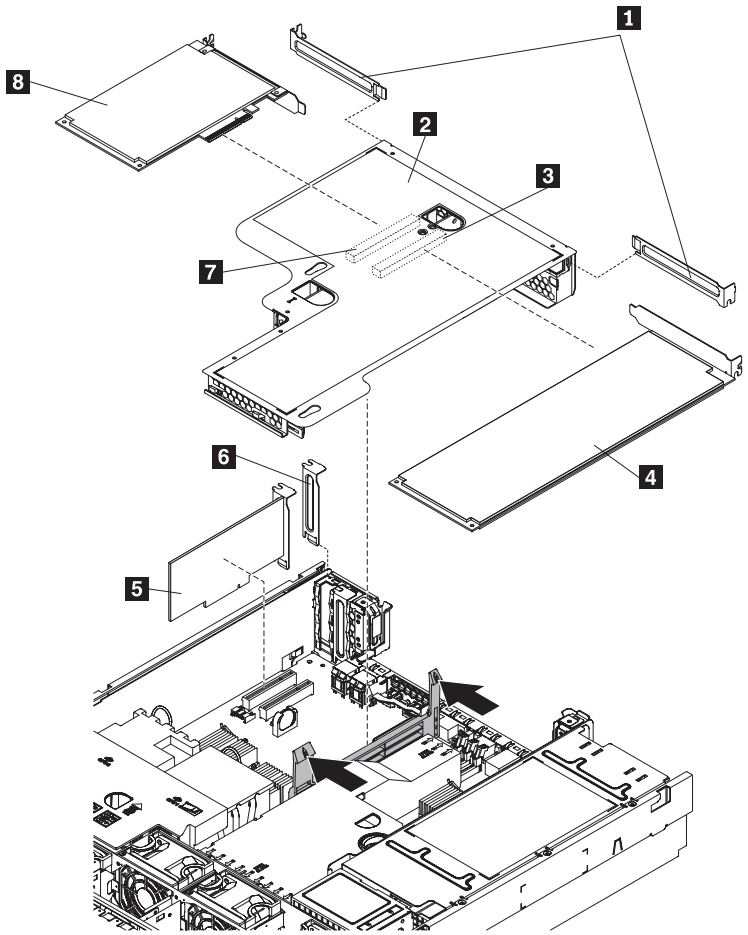
   - When you route cables, do not block any connectors or the ventilated space around any of the fans.
   - Make sure that cables are not routed on top of components under the PCI riser-card assembly.
   - Make sure that cables are not pinched by the server components.

10. Perform any configuration tasks that are required for the adapter.

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Removing an adapter

To remove an adapter, complete the following steps.

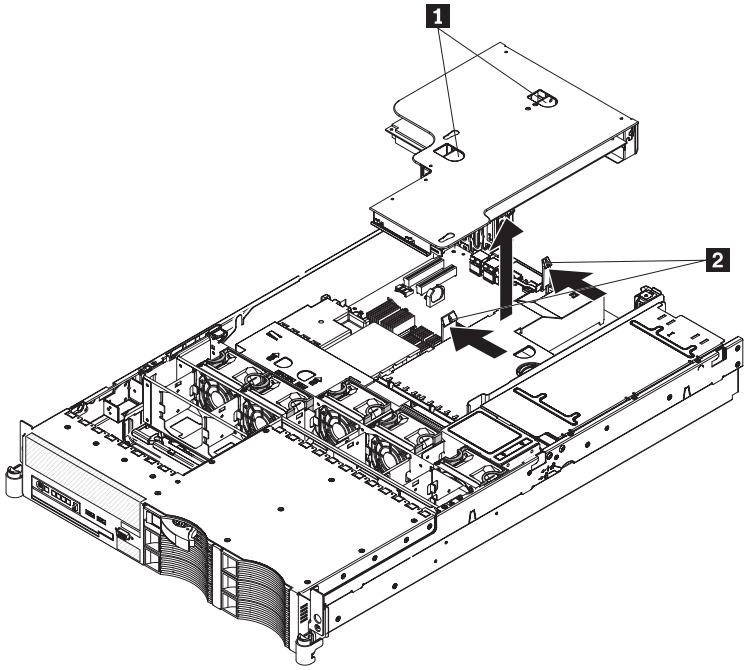


1	Expansion slot cover	5	Low-profile PCI Express adapter
2	Raiser-card assembly	6	Expansion slot cover
3	Expansion slot 1	7	Expansion slot 2
4	Adapter	8	Adapter

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 12).

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Pull the server out of the rack; then, remove the cover (see “Removing the cover” on page 31).

5. If the adapter is on the riser card, remove the riser-card assembly from the server (see “Removing the riser-card assembly” on page 32).



1 Access holes
2 Release tabs

6. Disconnect any cables from the adapter.
7. Carefully grasp the adapter by its top edge or upper corners, and pull the adapter from the PCI slot.
8. If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Replacing the RAID SAS controller

A ServeRAID SAS controller can be installed only in a dedicated slot on the system board. The server comes with a ServeRAID-8k-l SAS Controller installed.

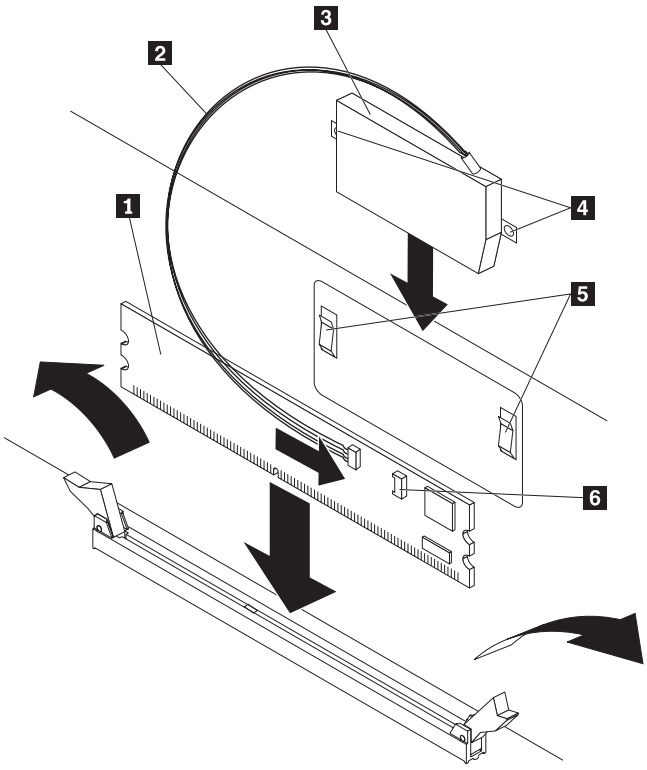
Note: The ServeRAID-8k-l SAS Controller does not have a battery.

To replace the ServeRAID-8k-l SAS Controller with a ServeRAID-8k SAS Controller, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 12).

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Remove the riser-card assembly and the air baffle over the DIMMs (see “Removing the DIMM air baffle” on page 37).
5. Locate the ServeRAID-8k-l SAS controller on the system board (see “System-board optional-device connectors” on page 18).

   Attention: To avoid breaking the retaining clips or damaging the connectors, handle the clips gently.
6. Open the retaining clip on each end of the connector.
7. Lift the ServeRAID-8k-l SAS controller out of the connector.
8. Touch the static-protective package that contains the new ServeRAID-8k SAS controller to any unpainted metal surface on the server. Then, remove the ServeRAID-8k SAS controller from the package.



1	RAID controller	4	Battery mounting tabs
2	Battery cable	5	Battery mounting clips
3	Battery	6	Battery cable connector

9. Turn the new ServeRAID-8k SAS controller so that the keys on the bottom edge align correctly with the connector.
10. Firmly press the ServeRAID-8k SAS controller straight down into the connector by applying pressure on both ends of the controller simultaneously. The retaining clips snap into the locked position when the controller is firmly seated in the connector.

    Note: If there is a gap between the controller and the retaining clips, the controller has not been correctly installed. In this case, open the retaining clips and remove the controller; then, reinsert the controller.
11. Remove the battery from the ServeRAID-8k SAS Controller package.
12. Slide the battery mounting tabs into the battery mounting clips on the server wall that is next to the ServeRAID SAS controller connector.
13. Connect the battery to the ServeRAID-8k SAS Controller.
14. Replace the air baffle over the DIMMs (see “Installing the DIMM air baffle” on page 38).
15. Replace the riser-card assembly (see “Installing the riser-card assembly” on page 34).

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Notes:

1. When you restart the server for the first time after you install a ServeRAID-8k SAS controller, the monitor screen remains blank while the controller initializes

the battery. This might take a few minutes, after which the startup process continues. This is a one-time occurrence.

Important: You must allow the initialization process to be completed. If you do not, the battery will not work, and the server might not start.

The battery comes partially charged, at 30% or less of capacity. Run the server for 4 to 6 hours to fully charge the controller battery. The LED just above the battery on the controller remains lit until the battery is fully charged.

Until the battery is fully charged, the controller firmware sets the controller cache to write-through mode; after the battery is fully charged, the controller firmware re-enables write-back mode.

2. When you restart the server, you will be given the opportunity to import the existing RAID configuration to the new ServeRAID-8k SAS Controller.

Installing a hard disk drive

Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.

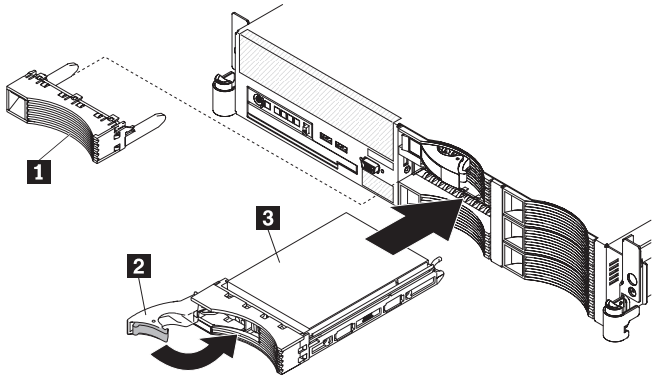
Important: Do not install a SCSI hard disk drive in this server; install only SAS hard disk drives.

The following notes describe the type of hard disk drive that the server supports and other information that you must consider when installing a hard disk drive:

- The server 3.5-inch models support six slim 3.5-inch hard disk drives installed on Ultra-Slim hard disk drive trays for 3.5-inch drives. For a list of supported 3.5-inch hard disk drives, see http://www.lenovo.com/thinkserver.
- The server 2.5-inch models support eight 2.5-inch hot-swap hard disk drives installed on Ultra-Slim hard disk drive trays for 2.5-inch drives. For a list of supported 2.5-inch hard disk drives, see http://www.lenovo.com/thinkserver.
- All hot-swap drives in the server should have the same throughput speed rating. Mixing hard disk drives with different speed ratings will cause all drives to operate at the lower throughput speed.
- The ID that is assigned to each bay is printed on the front of the server.

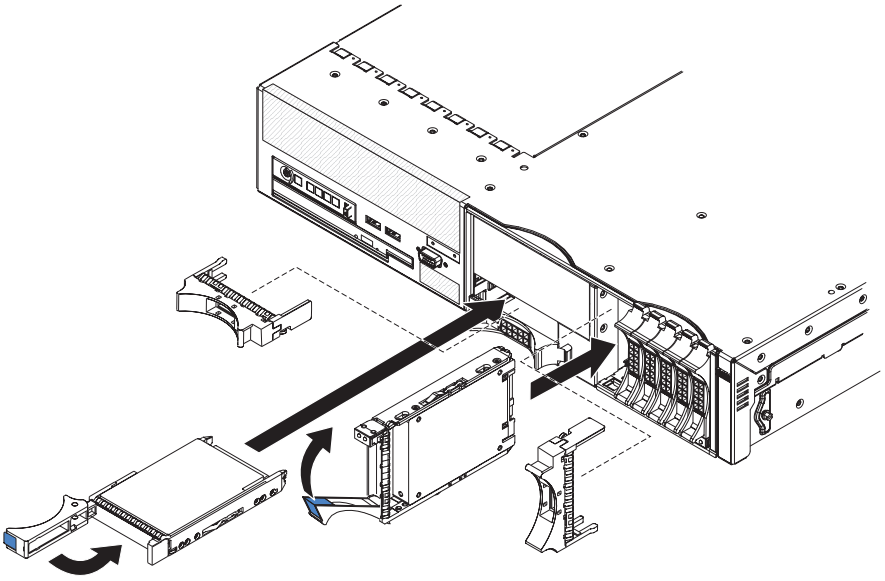
The following illustrations show how to install a hot-swap hard disk drive.

3.5-inch drives



1 Filler panel
2 Tray handle
3 Hard disk drive

2.5-inch drives



To install a drive in a hot-swap bay, complete the following steps.

Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each bay.

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Remove the filler panel from one of the empty hot-swap bays.
   - 3.5-inch models: Insert your finger into the depression at the left side of the filler panel and pull it away from the server.
   - 2.5-inch models: Grasp both sides of the front of the filler panel and pull it away from the server.
3. Install the hard disk drive in the hot-swap bay:
   a. Make sure that the tray handle is open (that is, perpendicular to the drive).
   b. Align the drive assembly with the guide rails in the bay.
   c. Gently push the drive assembly into the bay until the drive stops.
   d. Push the tray handle to the closed (locked) position.
   e. Check the hard disk drive status LED to verify that the hard disk drive is operating correctly.

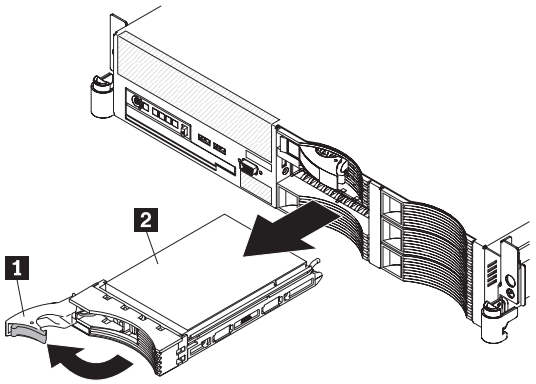
      If the amber hard disk drive status LED for a drive is lit continuously, that drive is faulty and must be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.

   Note: You might have to reconfigure the disk arrays after you install hard disk drives. See the RAID documentation on the IBM *ServeRAID Support* CD for information about these RAID controllers.

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

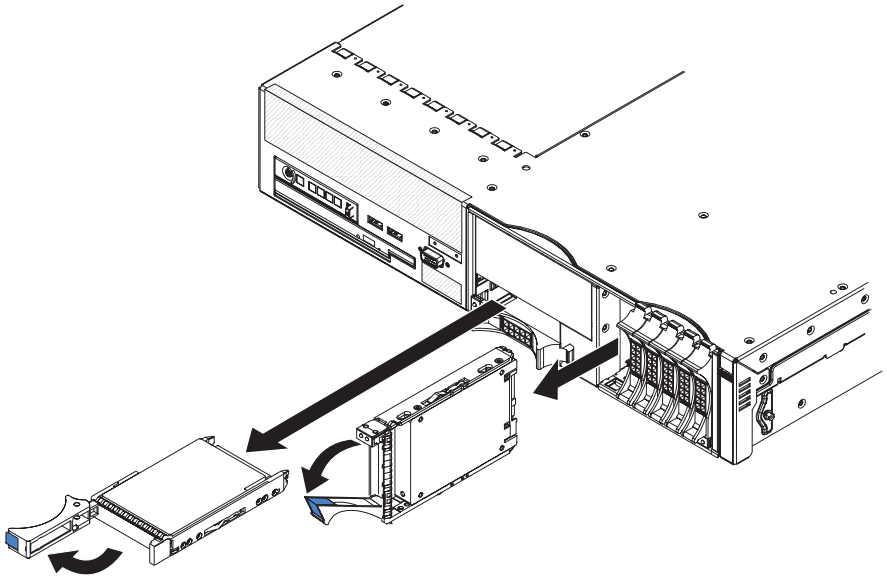
Removing a hard disk drive

3.5-inch drives



1 Tray handle
2 Hard disk drive

2.5-inch drives



To remove a hot-swap hard disk drive, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Move the tray handle on the drive to the open position (perpendicular to the drive).
3. Pull the hot-swap drive assembly from the bay.

   Note: You might have to reconfigure the disk arrays after you remove a hard disk drive.

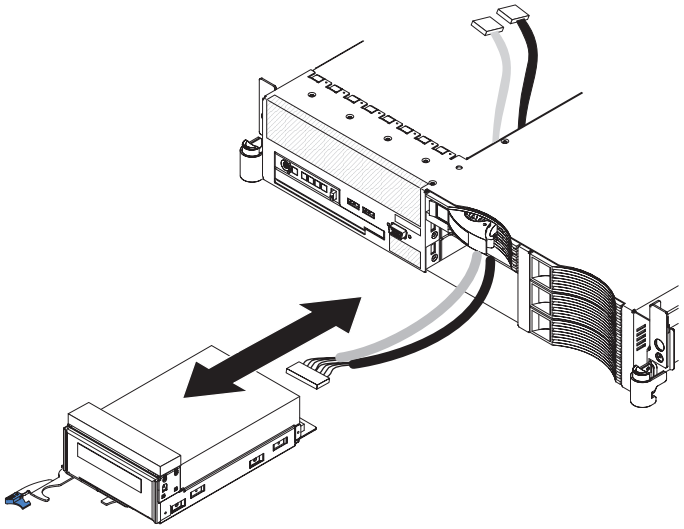
If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Installing an optional tape drive

Prepare the drive according to the instructions that come with the drive, setting any switches or jumpers; then, see “Installing a SATA tape drive in a 3.5-inch model server” or “Installing a SATA tape drive in a 2.5-inch model server” on page 53.

Installing a SATA tape drive in a 3.5-inch model server

Install the optional SATA tape drive in the two bottom-left hard disk drive bays. If hard disk drives are installed in those bays, move the drives to other bays. The cables for the tape drive come with the tape drive.



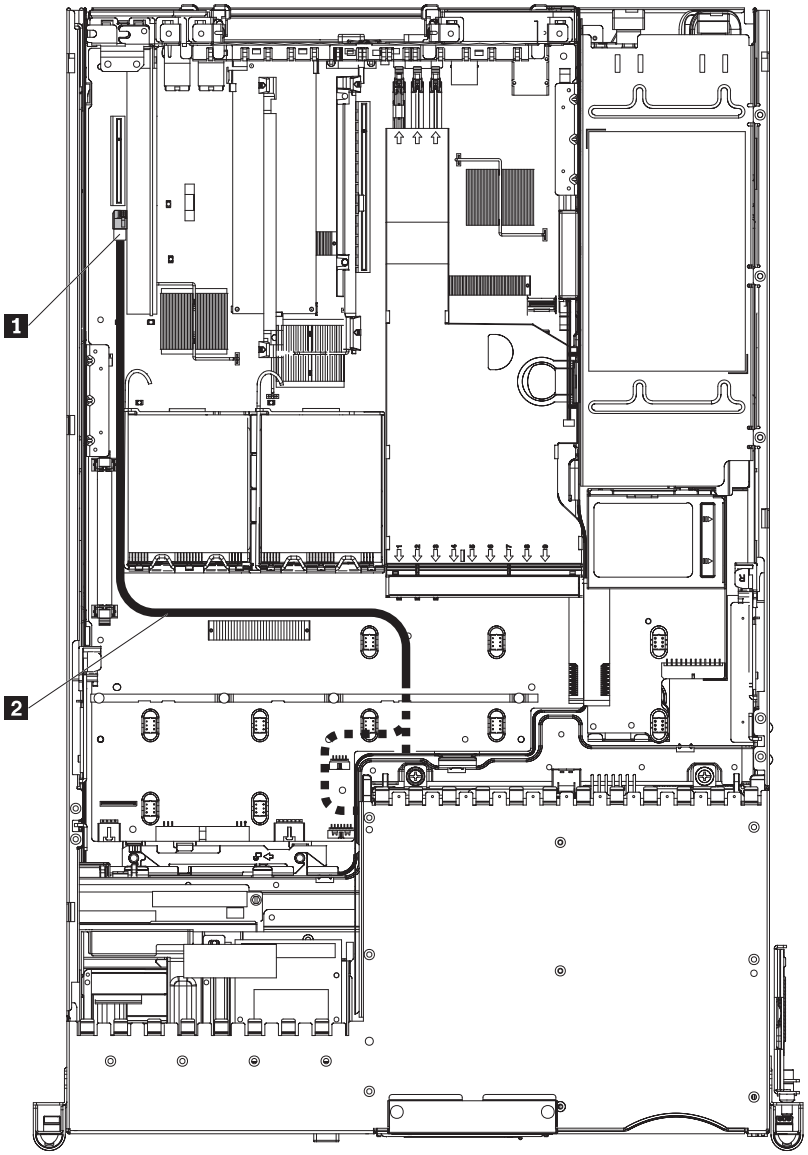
To install a tape drive in a 3.5-inch model server, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server cover (see “Removing the cover” on page 31).
4. Remove the fan-bracket assembly (see “Removing the fan-bracket assembly” on page 70).
5. Remove the filler panels from the two bottom-left hard disk drive bays.
6. If you have not attached the space filler from the tape enablement kit to the tape-drive assembly, do so now.
7. From the inside of the server, thread the tape-drive end of the cables through the slot in the left side of the hard disk drive cage and out the front of the server.
8. Connect the cables to the back of the tape drive.
9. Push the tape-drive assembly into the bays, gently pulling the cables farther into the server as you do so, until the tape-drive assembly stops.
10. Push the tray handle to the closed (locked) position.
11. Connect the cable connectors to the following system-board connectors (see “System-board internal cable connectors” on page 20 for the location of the connectors):
    - Signal connector: SATA tape drive signal connector, J102
    - Power connector: tape-drive power connector, J100

    The following illustration shows the routing of the SATA tape drive signal cable.

    Important: Make sure that the cables avoid any fan connectors.

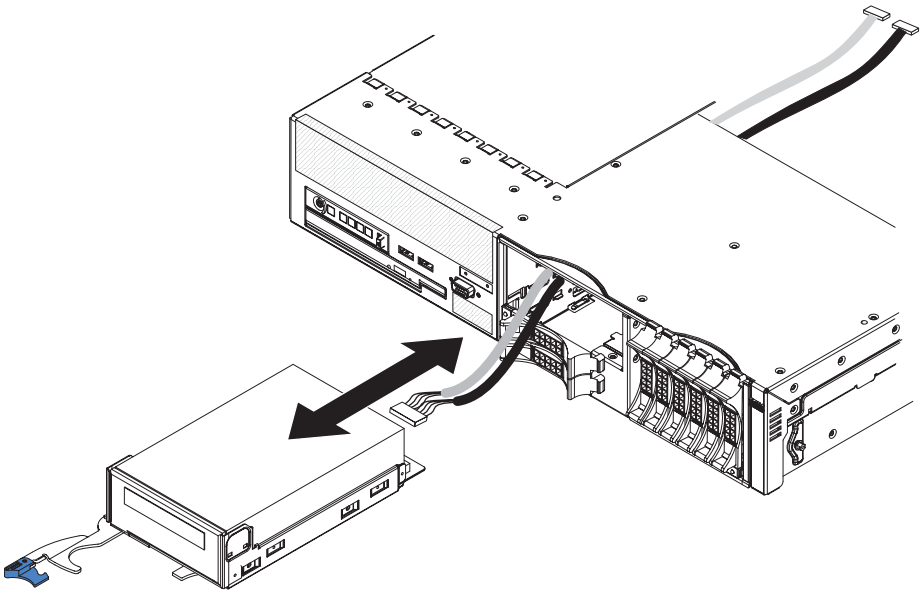


1 SATA tape cable connector
2 SATA tape cable

12. Install the fan-bracket assembly (see “Installing the fan-bracket assembly” on page 72).

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Installing a SATA tape drive in a 2.5-inch model server



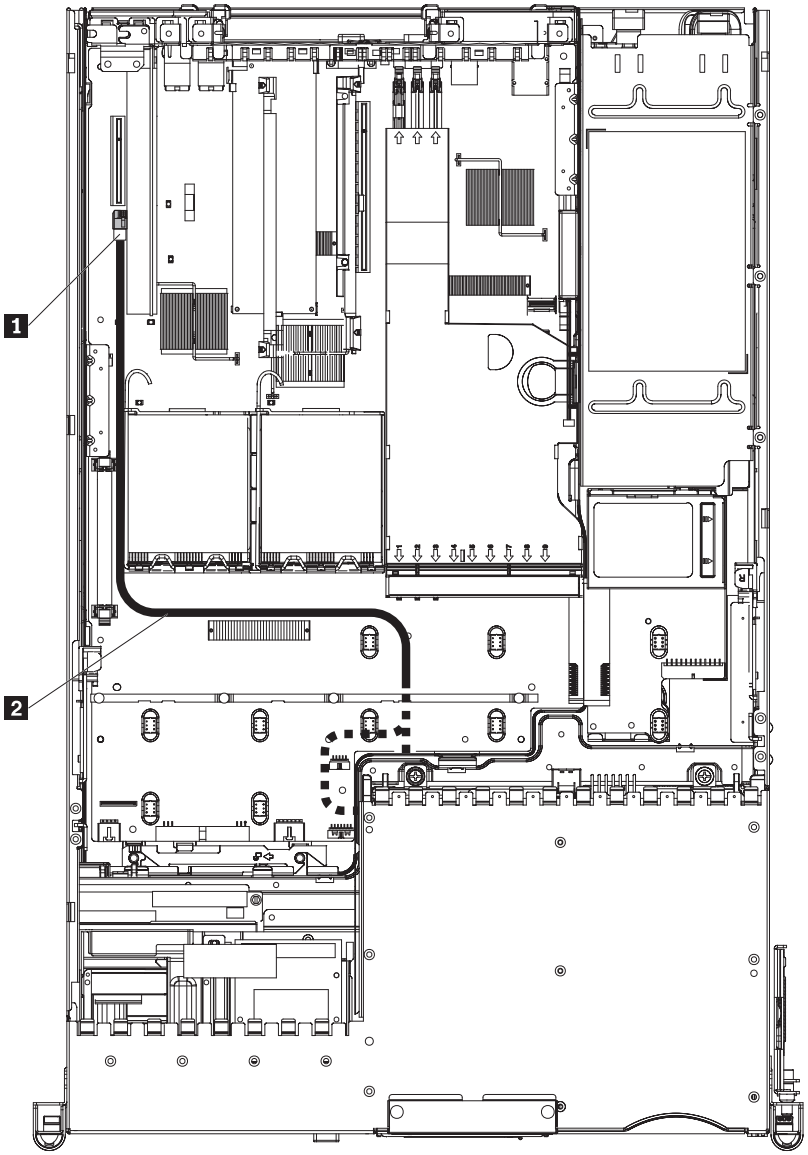
To install a tape drive in a 2.5-inch model server, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. If you installed the space filler from the tape enablement kit onto the tape-drive assembly, remove it now.
4. Remove the server cover (see “Removing the cover” on page 31).
5. Remove the fan-bracket assembly (see “Removing the fan-bracket assembly” on page 70).
6. Remove the filler panel from the tape-drive bay.
7. From the inside of the server, thread the tape-drive end of the cables for your tape drive through the rear of the tape-drive bay and out the front of the server.
8. Connect the cable or cables to the back of the tape drive.
9. Push the tape-drive assembly into the tape-drive bay, gently pulling the cables farther into the server as you do so, until the tape-drive assembly stops.
10. Push the tray handle to the closed (locked) position.
11. Connect the cable connectors to the following system-board connectors (see “System-board internal cable connectors” on page 20 for the location of the connectors):
    - Signal connector: SATA tape drive signal connector, J102
    - Power connector: tape-drive power connector, J100

    The following illustration shows the routing of the SATA tape drive signal cable.

    Important: Make sure that the cables avoid any fan connectors.



1 SATA tape cable connector
2 SATA tape cable

12. Install the fan-bracket assembly (see “Installing the fan-bracket assembly” on page 72).

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Installing a microprocessor

The following notes describe the type of microprocessor that the server supports and other information that you must consider when installing a microprocessor:

- The server supports certain Intel Xeon dual-core or quad-core flip-chip land grid array 771 (FC-LGA 771) microprocessors, which are designed for the LGA771 socket. See http://www.lenovo.com/thinkserver for a list of supported microprocessors.

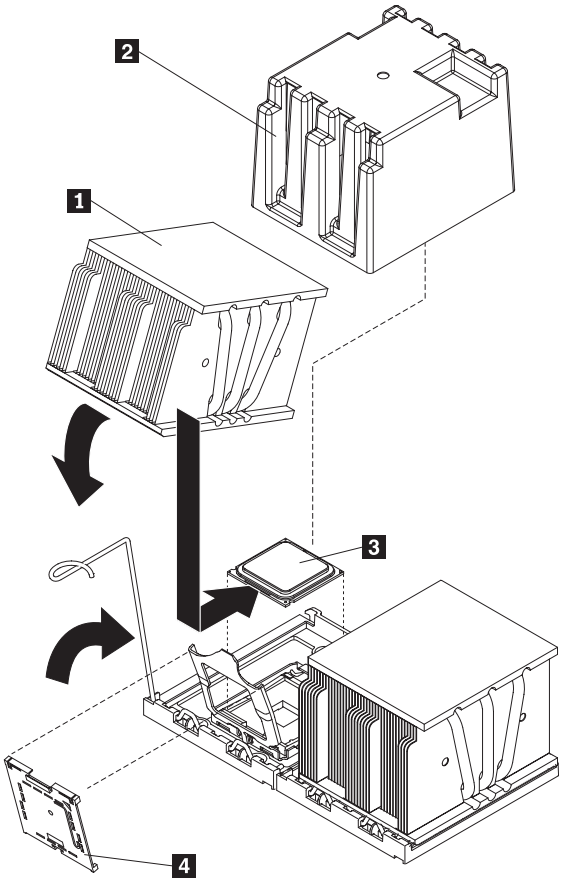
Important: Dual-core and quad-core microprocessors are not interchangeable and cannot be used in the same server. For example, if the server has a dual-core microprocessor, you cannot install a quad-core microprocessor as the second microprocessor. Use the Configuration/Setup Utility program to determine the type and speed of the microprocessor that is currently installed in the server.

- The server supports up to two microprocessors. If the server comes with one microprocessor, you can install a second microprocessor.
- Both microprocessors must have the same cache size and type, front-side bus frequency, and clock speed. Microprocessor internal and external clock frequencies must be identical.
- When you install a microprocessor in microprocessor connector 2, you must also install the voltage regulator module (VRM), which comes with the microprocessor, in the VRM connector.
- Read the documentation that comes with the microprocessor to determine whether you must update the basic input/output system (BIOS) code for the server. To download the most current level of BIOS code and many other code updates for your server, complete the following steps:
  1. Go to: http://www.lenovo.com/support.
  2. Enter your product number (machine type and model number) or select **Servers and Storage** from the **Select your product** list.
  3. From **Family** list, select **ThinkServer RD120**, and click **Continue**.
  4. Click **Downloads and drivers** to download firmware updates.
- To order additional microprocessor optional devices, contact your Lenovo marketing representative or authorized reseller.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- If you have to replace a microprocessor, call for service.
- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink, do not touch the thermal grease on the bottom of the heat sink or set down the heat sink.
- Do not remove the first microprocessor from the system board to install the second microprocessor.

See “System-board optional-device connectors” on page 18 for the location of the microprocessor connectors and the VRM connector.

The following illustration shows how to install the second microprocessor on the system board.

Note: For simplicity, certain components are not shown in this illustration.



1	Heat sink
2	Heat-sink filler
3	Microprocessor
4	Microprocessor-socket dust cover

Attention:

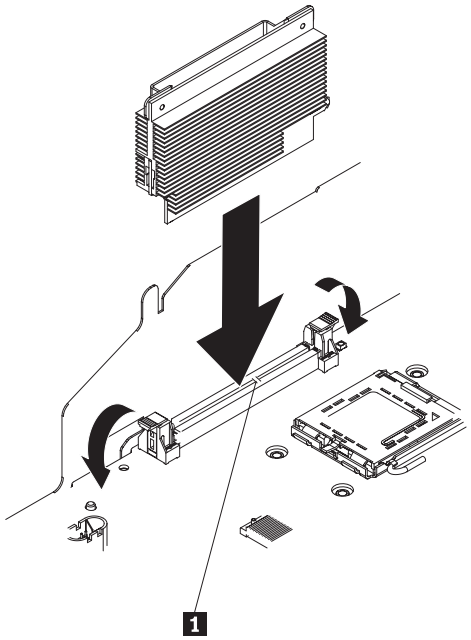
- A startup (boot) microprocessor must always be installed in microprocessor connector 1 on the system board.
- To ensure correct server operation when you install an additional microprocessor, use microprocessors that have the same cache size and type, front-side bus frequency, and clock speed. Microprocessor internal and external clock frequencies must be identical.

To install an additional microprocessor, complete the following steps:

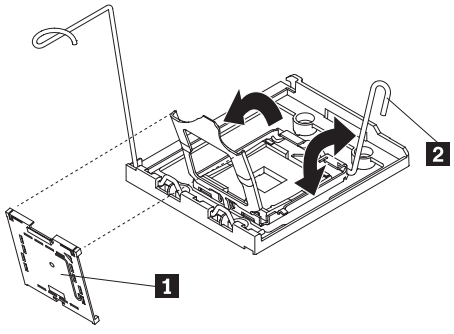
1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and disconnect all power cords and external cables (see “Turning off the server” on page 12).

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server cover (see “Removing the cover” on page 31).

4. Remove the microprocessor air baffle (see “Removing the microprocessor air baffle” on page 34).
5. Install the VRM in the VRM connector.



   a. Touch the static-protective package containing the VRM to any unpainted metal surface on the outside of the server. Then, remove the VRM from the package.
   b. Turn the VRM so that the keys align correctly with the VRM connector **1** .
   c. Firmly press the VRM straight down into the connector by applying pressure on both ends of the VRM simultaneously.
   d. Make sure that the retaining clips are in the locked position when the VRM is firmly seated in the connector.
6. Locate the second microprocessor connector on the system board.
7. Rotate the heat-sink release lever to the fully open position.
8. Lift the heat-sink filler out of the server.
9. Install the microprocessor:
   a. Touch the static-protective package that contains the microprocessor to any unpainted metal surface on the server. Then, remove the microprocessor from the package.

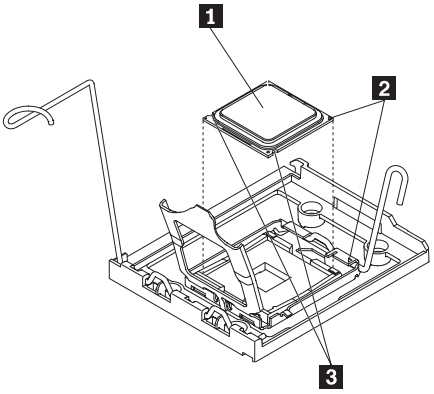


   b. Remove the protective dust cover **1** , tape, or label from the surface of the microprocessor socket, if one is present.

c. Rotate the microprocessor release lever 2 on the socket from its closed and locked position until it stops in the fully open position.

Attention:

- Do not touch the microprocessor contacts; handle the microprocessor by the edges only. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
- Handle the microprocessor carefully. Dropping the microprocessor during installation or removal can damage the contacts.
- Do not use excessive force when you press the microprocessor into the socket.
- Make sure that the microprocessor is oriented, aligned, and positioned in the socket before you try to close the lever.



1 Microprocessor
2 Alignment marks
3 Notches

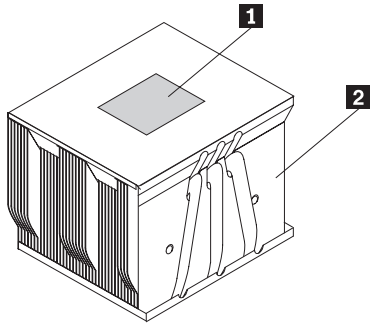
d. Align the microprocessor with the socket (note the alignment mark and the position of the notches); then, carefully place the microprocessor in the socket. Close the microprocessor bracket frame.

Note: The microprocessor fits only one way on the socket.

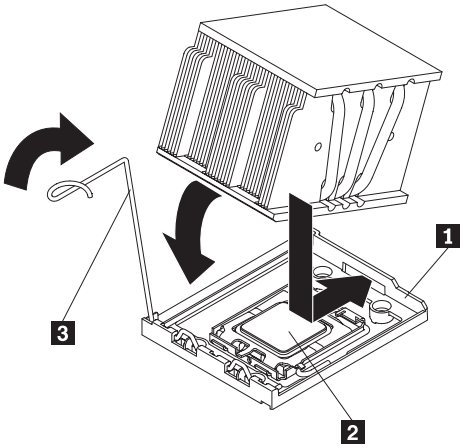
e. Carefully close the microprocessor release lever to secure the microprocessor in the socket.

10. Install a heat sink on the microprocessor.

Attention: Do not touch the thermal grease 1 on the bottom of the heat sink 2 or set down the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it.



a. Make sure that the heat-sink release lever is in the open position.
b. Remove the plastic protective cover from the bottom of the heat sink.
c. Align the heat sink above the microprocessor with the thermal-grease side down.



1 Retainer bracket
2 Microprocessor
3 Heat-sink-release lever

d. Slide the rear flange of the heat sink into the opening in the retainer bracket.
e. Press down firmly on the front of the heat sink until it is seated securely.
f. Rotate the heat-sink release lever to the closed position and hook it underneath the lock tab.

11. Install the microprocessor air baffle (see “Installing the microprocessor air baffle” on page 36).

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Installing a memory module

The following notes describe the types of dual inline memory modules (DIMMs) that the server supports and other information that you must consider when installing DIMMs:

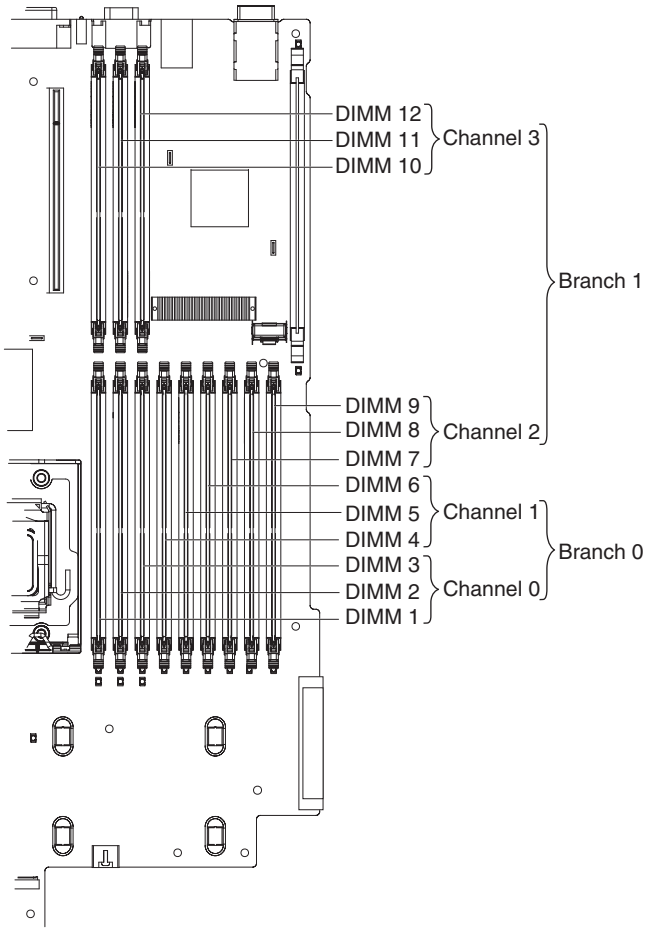
- The server supports up to 12 Fully Buffered DIMM PC2-5300 512 MB, 1 GB, 2 GB, and 4 GB DIMMs, for a maximum of 48 GB of system memory. See http://www.lenovo.com/thinkserver/ for a list of memory modules that you can use with the server.

  Note: Because some memory is reserved for system operation, the actual usable memory size that is reported by the operating system is less than the total installed size.
- The server comes with a minimum of two 512 MB DIMMs, installed in slots 1 and 4. When you install additional DIMMs, you must install two identical DIMMS at a time, in the order shown in the following table, to maintain performance.

Table 3. DIMM installation sequence

Pair	DIMM connectors
1	1 and 4
2	7 and 10
3	2 and 5
4	8 and 11
5	3 and 6
6	9 and 12

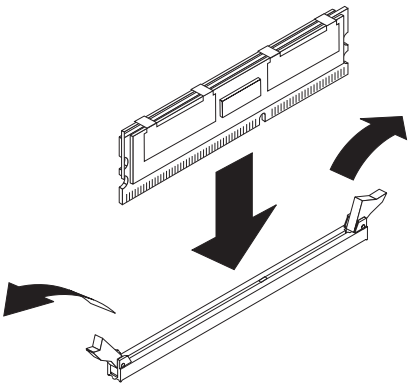
Note: When only one pair of DIMMs is installed in the server and the BIOS code level is version 1.04 (GGE127A) or later, you can improve performance by installing the DIMMs in connectors 1 and 7 instead of 1 and 4. However, because the connectors in the pair are not on the same memory branch (see the following illustration), Advanced ECC memory protection is disabled.



- Each DIMM in a pair must be the same size, speed, type, and technology to ensure that the server will operate correctly.
- You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. If a failure occurs, the memory controller switches from the active pair to the mirroring pair. See “Memory mirroring” on page 62 for more information about memory mirroring and the DIMM installation sequence that is required.
- The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare pair of DIMMs to replace the failed active DIMM pair. See “Online-spare memory” on page 63 for more information about online-spare memory and the DIMM configuration that is required.
- You can enable either online-spare memory or memory mirroring, but not both at the same time. Online-spare memory provides more memory capacity than mirroring. Mirroring provides better memory protection but less memory capacity than online-spare memory.
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.

  Note: When 4 GB or more of memory (physical or logical) is installed, some memory is reserved for various system resources and is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.

To install a DIMM, complete the following steps.



1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
4. Remove the riser-card assembly (see “Removing the riser-card assembly” on page 32).
5. Remove the DIMM air baffle (see “Removing the DIMM air baffle” on page 37).
6. Open the retaining clip on each end of the DIMM connector.
7. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.
8. Turn the DIMM so that the DIMM keys align correctly with the connector.
9. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

   Important: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Memory mirroring

You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. If a failure occurs, the memory controller switches from the active pair to the mirroring pair. Memory mirroring reduces the amount of available memory. Enable memory mirroring through the Configuration/Setup Utility program. See “Configuration/Setup Utility menu choices” on page 80 for details about enabling memory mirroring.

When you use memory mirroring, you must install two pairs of DIMMs at a time. The four DIMMs in each group must be identical. See Table 4 for the DIMM connectors that are in each group.

Table 4. Memory mirroring DIMM installation sequence

Group	DIMM connectors
1	1, 4, 7, and 10
2	2, 5, 8, and 11
3	3, 6, 9, and 12

Table 5. Memory mirroring DIMM functions

Group	Active DIMMs	Mirroring DIMMs
1	1, 4	7, 10
2	2, 5	8, 11
3	3, 6	9, 12

Online-spare memory

The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare pair of DIMMs to replace the failed active DIMM pair.

Online-spare memory reduces the amount of available memory. Before you can enable this feature, you must install up to two additional pairs of DIMMs. The online-spare DIMM pairs must be the same speed, type, and the same size as, or larger than, the largest active DIMM pairs.

Enable online-spare memory through the Configuration/Setup Utility program. The BIOS code assigns the online-spare DIMM pairs according to your DIMM configuration. Online-sparing is enabled on a memory branch basis; the BIOS code does not enable online-sparing on a branch that cannot support online-sparing. See the illustration on page 61 for the memory branch structure. DIMM ranks are online-spared if the DIMMs are installed according to the rules in Table 6 on page 64 or Table 7 on page 64.

Note: POST gives a warning message when online-sparing cannot be enabled on both branches. However, no warning message is given when online-sparing is enabled on one branch and disabled on the other.

Online-spare configurations are supported for each branch. See Table 6 on page 64 and Table 7 on page 64 for the online-spare DIMM connector assignments.

Important: Table 6 on page 64 shows the basic DIMM online-spare scheme. If the BIOS code level is version 1.04 or later, you can install the DIMMs according to the alternative scheme, shown in Table 7 on page 64, instead.

In the configuration that you use, install the largest DIMMs first.

Table 6. Online-spare DIMM configurations, basic scheme

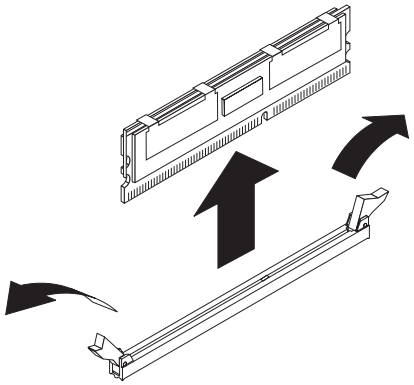
Number of DIMMs	DIMM connectors	Results
4	1 and 4 (largest DIMMs) 2 and 5	Online-sparing on branch 0
6	1 and 4 (largest DIMMs) 2 and 5 3 and 6	Online-sparing on branch 0
8	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 (dual-rank DIMMs only)	Online-sparing on branch 0 Online-sparing on dual-rank DIMMs on branch 1
10	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 8 and 11	Online-sparing on branch 0 Online-sparing on branch 1
12	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 8 and 11 9 and 12	Online-sparing on branch 0 Online-sparing on branch 1

Table 7. Online-spare DIMM configurations, alternative scheme (requires BIOS code version 1.04 or later)

Number of DIMMs	DIMM connectors	Results
4	7 and 10 (largest DIMMs) 8 and 11	Online-sparing on branch 1
6	7 and 10 (largest DIMMs) 8 and 11 9 and 12	Online-sparing on branch 1
8	7 and 10 (largest DIMMs) 8 and 11 9 and 12 1 and 4 (dual-rank DIMMs only)	Online-sparing on branch 1 Online-sparing on dual-rank DIMMs on branch 0
10	1 and 4 (largest DIMMs) 2 and 5 7 and 10 8 and 11 9 and 12	Online-sparing on branch 0 Online-sparing on branch 1
12	N/A	N/A

Removing a memory module

To remove a DIMM, complete the following steps.



1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Remove the riser-card assembly (see “Removing the riser-card assembly” on page 32).
5. Remove the air baffle over the DIMMs (see “Removing the DIMM air baffle” on page 37).

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
6. Open the retaining clip on each end of the DIMM connector.
7. Lift the DIMM out of the connector.
8. Replace the DIMM or remove the second DIMM of the pair.

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Installing a hot-swap power supply

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

The server supports a maximum of two hot-swap ac power supplies.

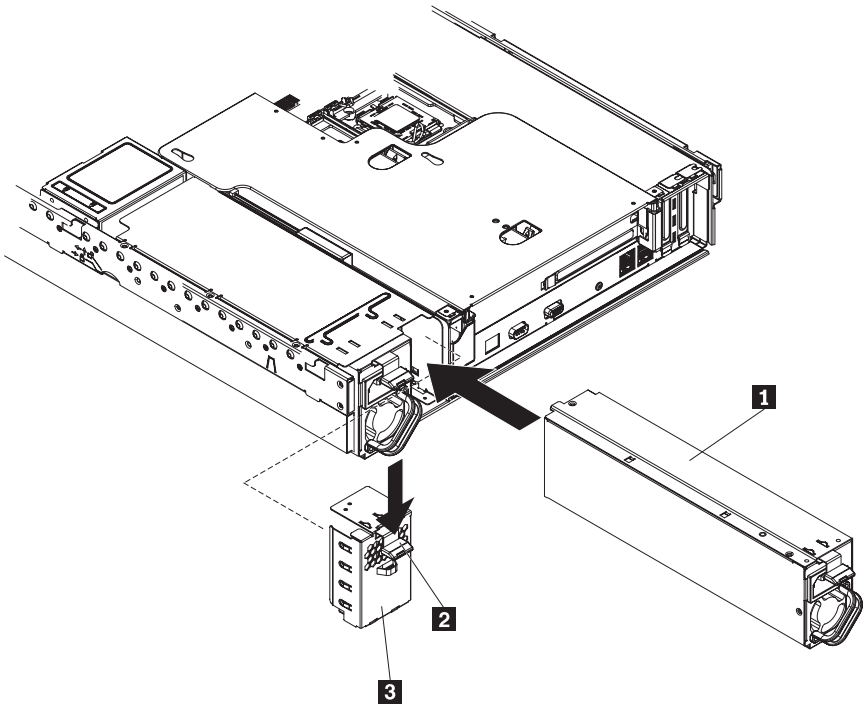
Important: Only the configurations that are shown in the following table are supported. The fan numbers are printed on the microprocessor air baffle.

Installed power supplies	Required
Power supply 1	Fans in locations 3, 4, 8, 9, and 10
Power supplies 1 and 2	All 10 fans

Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.



1 Hot-swap power supply 2
2 Power-supply-filler release lever
3 Power supply filler

To install an ac power supply, complete the following steps:

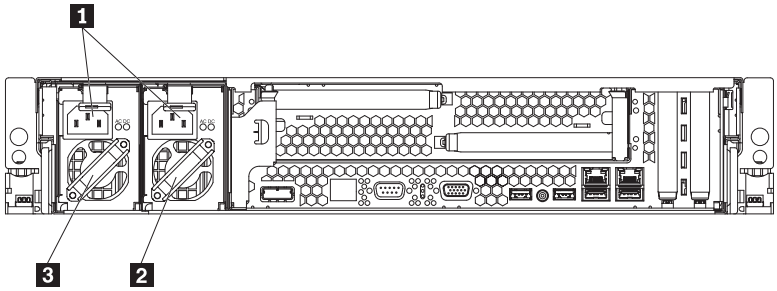
Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply for installation instructions.

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Remove the power-supply filler panel from the empty power-supply bay by pinching the side clip and pulling the power-supply filler panel from the bay. Save the power-supply filler panel in case you remove the power supply at a later time.

   Important: During normal operation, each power-supply bay must contain either a power supply or power-supply filler panel for proper cooling.
3. Slide the ac power supply into the bay until the retention latch clicks into place.
4. Remove the server cover and install the five cooling fans that came with the power-supply (see “Installing a fan” on page 68).

   Important: When power supply 1 is installed, the five fans for power supply 1 occupy the rear row only (fans 3, 4, 8, 9, and 10); when both power supplies are installed, all 10 fans must be installed. See the fan numbers on the microprocessor air baffle, or see the illustration in “Removing a fan” on page 69.
5. Connect the power cord for the new ac power supply to the power-cord connector on the power supply.

   The following illustration shows the ac power-supply connectors on the back of the server.



1 Power cord connectors
2 Power supply 2
3 Power supply 1

6. Route the power cord through the power-supply handle and through any cable clamps on the rear of the server to prevent the power cord from being accidentally pulled out when you slide the server in and out of the rack.
7. Connect the power cord to a properly grounded electrical outlet.
8. Make sure that the dc power LED and ac power LED on the power supply are lit, indicating that the power supply is operating correctly.

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Removing a hot-swap power supply

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

Important: If the server has two power supplies and you remove either of them, the server will not have redundant power; if the server power load then exceeds 835 W, the server might not start or might not function correctly.

To remove a power supply, complete the following steps:

1. If only one power supply is installed, turn off the server and peripheral devices.
2. Disconnect the power cord from the power supply that you are removing.
3. Grasp the power-supply handle.
4. Press the orange release latch down and hold it down.
5. Pull the power supply part of the way out of the bay.
6. Release the release latch; then, support the power supply and pull it the rest of the way out of the bay.

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Installing a fan

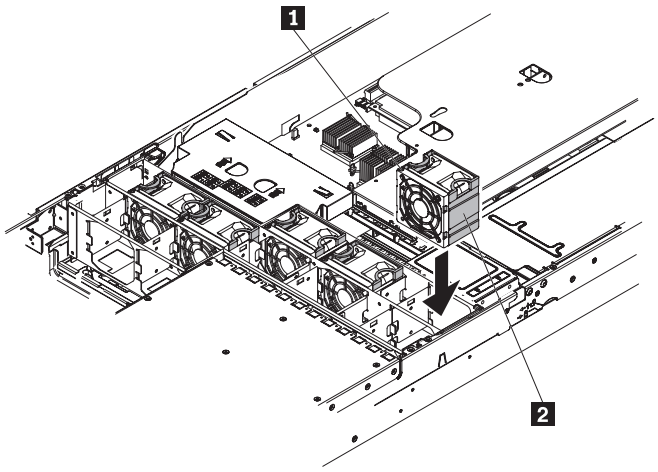
For proper cooling, the server requires that five fans be installed for each power supply installed.

The server comes with five replaceable fans. If you install a second power supply, you must install the set of five fans that come with the power-supply.

Important: Only the configurations that are shown in the following table are supported. The fan numbers are printed on the microprocessor air baffle.

Installed power supplies	Required fans
Power supply 1	Fans in locations 3, 4, 8, 9, and 10
Power supplies 1 and 2	All 10 fans

Attention: To ensure proper server operation, if a fan fails, replace it as soon as possible.



1 LED
2 Hot-swap fan

To install any of the 10 replaceable fans, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. If you have not done so already, slide the server out of the rack and remove the cover (see “Removing the cover” on page 31).

   Attention: To ensure proper system cooling, do not remove the top cover for more than 30 minutes during this procedure.
3. Orient the new fan over its position in the fan assembly bracket so that the LED on top of the fan is toward the left side of the server.
4. Push the new fan into the fan assembly bracket until it clicks into place.
5. Repeat until all the new fans are installed.

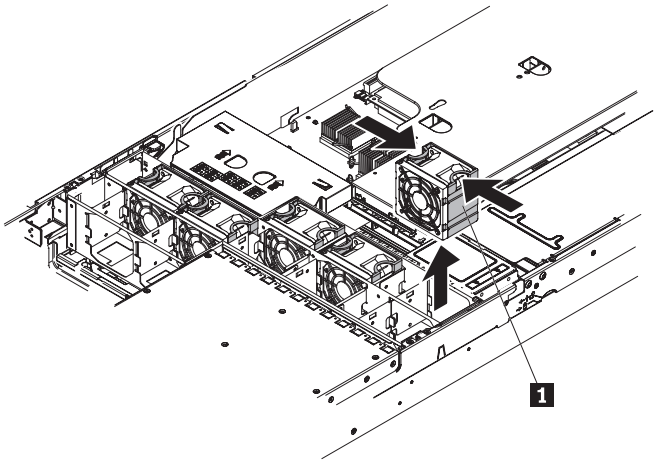
If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Removing a fan

The server comes with up to 10 replaceable fans.

Attention: To ensure proper server operation, if a fan fails, replace it as soon as possible.

To remove any of the 10 replaceable fans, complete the following steps.



1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Slide the server out of the rack and remove the cover (see “Removing the cover” on page 31). The LED on the failing fan will be lit.

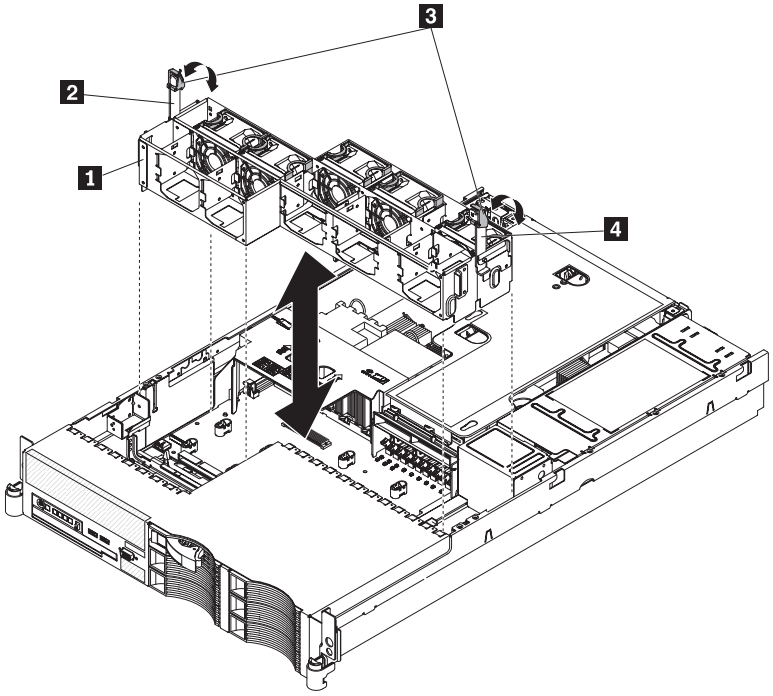
   Attention: To ensure proper system cooling, do not remove the top cover for more than 30 minutes during this procedure.
3. Place your fingers into the two handles on the top of the failing fan **1** .
4. Pull the handles toward each other and lift the fan out of the server.
5. Replace the fan as soon as possible (see “Installing a fan” on page 68).

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

Removing the fan-bracket assembly

To replace the CD-RW/DVD drive, you must remove the fan-bracket assembly; to route some cables, you might have to remove the fan-bracket assembly.

Note: To remove or install a fan, it is not necessary to remove the fan-bracket assembly. See “Removing a fan” on page 69 and “Installing a fan” on page 68.



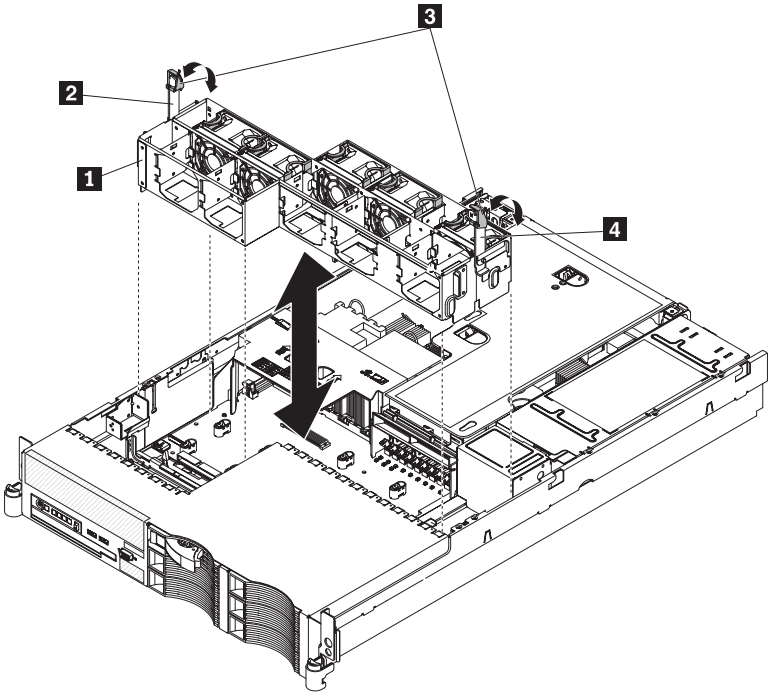
1 Fan bracket
2 Lever
3 Fan-bracket release latches
4 Lever

To remove the fan-bracket assembly, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Place your thumbs on the metal tabs of the fan-bracket-assembly levers and pinch the tab and blue release latch together; then, raise the levers, raising the fan-bracket assembly.
5. Grasp the levers and lift the fan-bracket assembly out of the server.

Installing the fan-bracket assembly



1	Fan bracket
2	Lever
3	Fan-bracket release latches
4	Lever

To install the fan-bracket assembly, complete the following steps:

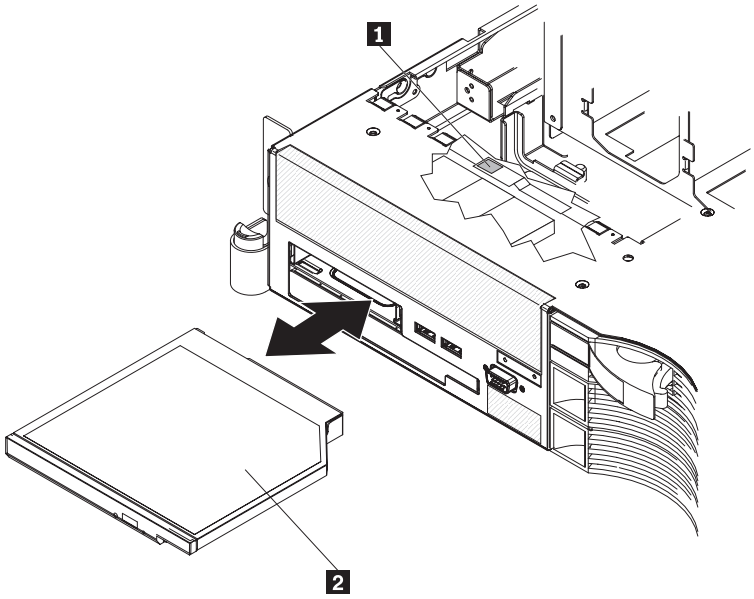
1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Make sure that the server and all peripheral devices are turned off and that the power cords and all external cables are disconnected.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Align the guides on the left and right sides of the assembly with the slots in the sides of the chassis.
4. Lower the fan-bracket assembly into the chassis.
5. Push the fan-bracket-assembly levers toward the rear of the server until they stop; pinch the release latches and metal tabs together and push the levers down into place.
6. Press down on the lever metal tabs and on the fans to make sure that the fan-bracket assembly is fully seated.

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 74.

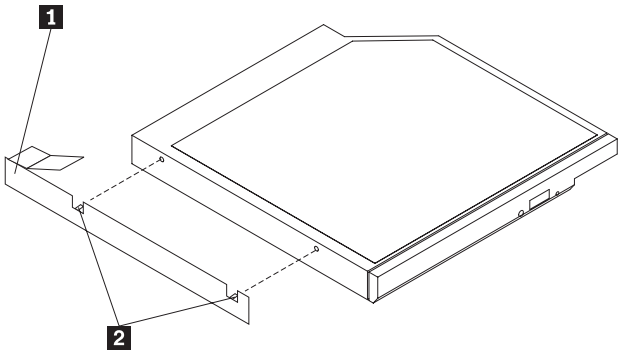
Replacing the CD-RW/DVD drive

To remove the CD-RW/DVD drive, complete the following steps.



1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.
3. Remove the cover (see “Removing the cover” on page 31).
4. Press the release tab **1** down to release the drive **2**; then, while pressing the tab, push the drive toward the front of the server.



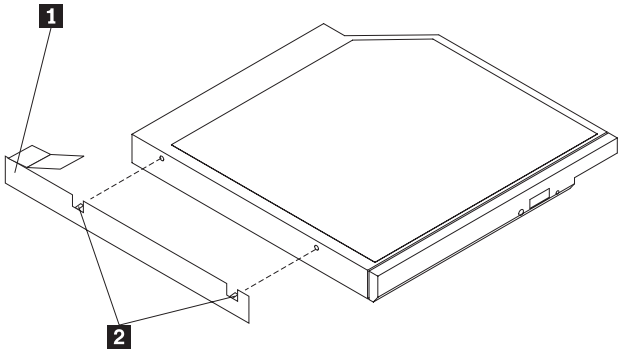
5. From the front of the server, pull the drive out of the bay.
6. Remove the retention clip **1** and alignment pins **2** from the drive.

To install a CD-RW/DVD drive, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Make sure that the server and peripheral devices are turned off, and that the power cords and all external cables are disconnected.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the cover (see “Removing the cover” on page 31).
4. Follow the instructions that come with the drive to set any jumpers or switches.



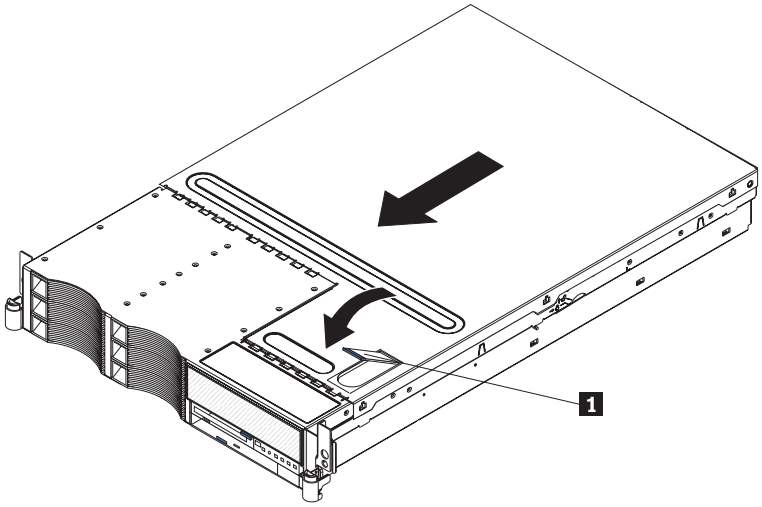
5. Attach the drive retention clip **1** to the side of the drive using the alignment pins **2**.
6. Slide the drive into the CD/DVD drive bay until the drive clicks into place.

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation.”

Completing the installation

To complete the installation, complete the following steps:

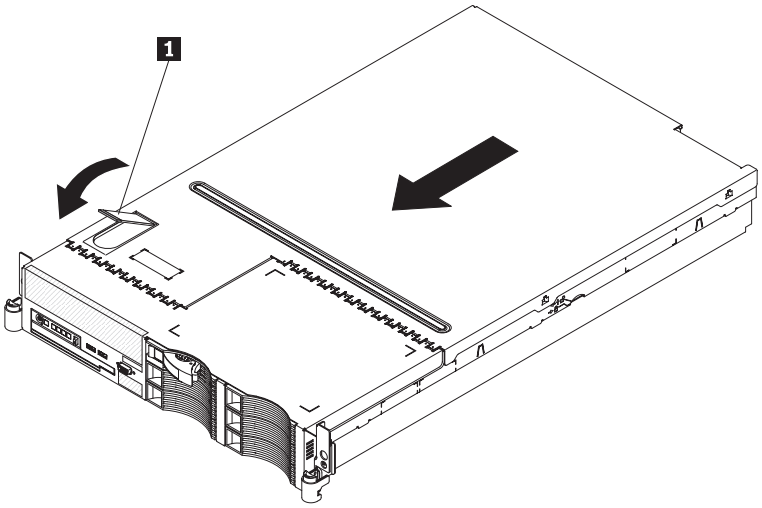
1. If you removed the PCI riser-card assembly, replace the riser-card assembly (see “Installing the riser-card assembly” on page 34).
2. If you removed any air baffles, replace the air baffles (see “Installing the microprocessor air baffle” on page 36 and “Installing the DIMM air baffle” on page 38).
3. If you removed the server cover, place the cover-release latch **1** in the open (up) position. Insert the bottom tabs of the top cover into the matching slots in the server chassis. Press down on the cover-release latch to lock the cover in place.



4. Install the server in a rack. See the *Rack Installation Instructions* that come with the server for complete rack installation and removal instructions.
5. To attach peripheral devices and connect the power cords, see “Connecting the cables.”

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Installing the cover



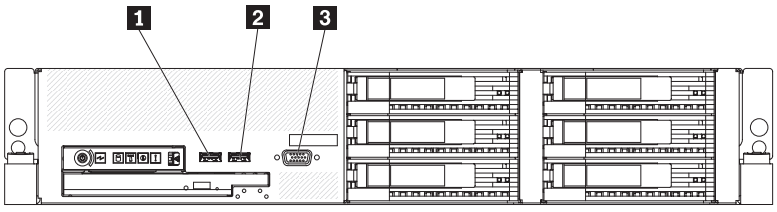
To install the cover, complete the following steps:

1. Place the cover-release latch **1** in the open (up) position.
2. Insert the bottom tabs of the top cover into the matching slots in the server chassis.
3. Press down on the cover-release latch to lock the cover in place.
4. Slide the server into the rack.

Connecting the cables

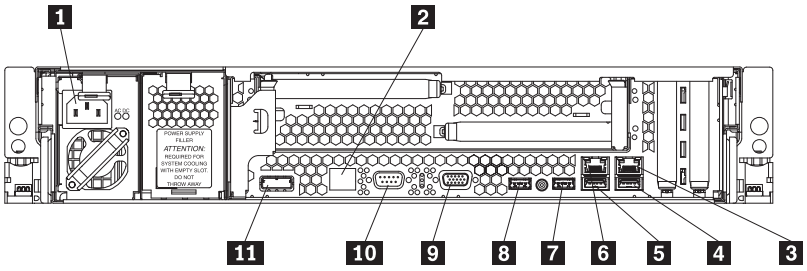
The following illustrations show the locations of the input and output connectors on the front and rear of the server.

Front view



1 USB 5 connector
2 USB 6 connector
3 Video connector

Rear view



1	Power cord connector	7	USB 2 connector
2	Systems-management Ethernet connector	8	USB 1 connector
3	Ethernet 1 connector	9	Video connector
4	USB 4 connector	10	Serial connector
5	USB 3 connector	11	SAS connector
6	Ethernet 2 connector		

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply for instructions and an illustration of the dc power supply.

You must turn off the server before you connect or disconnect cables from the server.

See the documentation that comes with any external devices for additional cabling instructions. It might be easier for you to route cables before you connect the devices to the server.

Cable identifiers are printed on the cables that come with the server and optional devices. Use these identifiers to connect the cables to the correct connectors.

If the server comes with an installed operating system, see the documentation that comes with the operating system for additional cabling instructions.

Updating the server configuration

When you start the server for the first time after you add or remove an internal device, external SAS device, or USB keyboard or mouse, you might receive a message that the configuration has changed. The Configuration/Setup Utility program starts automatically so that you can save the new configuration settings. For more information, see Chapter 3, “Configuring the server,” on page 79.

Some optional devices have device drivers that you must install. See the documentation that comes with each optional device for information about installing device drivers.

The server comes with at least one dual-core microprocessor, which enables the server to operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP. For more information, see Chapter 3, “Configuring the server,” on page 79 and the operating-system documentation.

If you have installed or removed a hard disk drive, see “Using the RAID Configuration Utility program” on page 87 for information about reconfiguring the disk arrays.

If you have installed a Remote Supervisor Adapter II SlimLine to manage the server remotely, see the *Remote Supervisor Adapter User's Guide*, which comes with the adapter, for information about setting up, configuring, and using the adapter.

For information about configuring the integrated Gigabit Ethernet controller, see “Configuring the Gigabit Ethernet controllers” on page 89.

Chapter 3. Configuring the server

The following configuration programs and capabilities come with the server:

- **Configuration/Setup Utility program**

  The Configuration/Setup Utility program is part of the basic input/output system (BIOS). Use it to configure serial port assignments, change interrupt request (IRQ) settings, change the startup-device sequence, set the date and time, and set passwords. For information about using this program, see “Using the Configuration/Setup Utility program” on page 79.

- *ThinkServer EasyStartup* **DVD**

  This bootable DVD automatically launches the ThinkServer EasyStartup program, which simplifies the process of installing an operating system and device drivers on your server. The ThinkServer EasyStartup program prompts you for information required by the operating system for installation, prepares the hard disk, prompts you to insert your operating system installation disc (CD or DVD), and launches an unattended installation of the operating system. For additional information, refer to the *ThinkServer RD120 Installation Guide*.

- **EasyManage software** ThinkServer EasyManage Core Server and ThinkServer EasyManage Agent work together to provide centralized hardware and software inventory management and secure automated system management through a single console. For information about installing EasyManage software, refer to the *ThinkServer RD120 Installation Guide*

- **RAID Configuration Utility program**

  Use the RAID Configuration Utility program to configure devices that are attached to the SAS controller. For information about using this program, see “Using the RAID Configuration Utility program” on page 87.

- **Ethernet controller configuration**

  For information about configuring the Ethernet controllers, see “Configuring the Gigabit Ethernet controllers” on page 89.

- **Baseboard management controller utility programs**

  Use these programs to configure the baseboard management controller, to update the firmware and sensor data record/field replaceable unit (SDR/FRU) data, and to remotely manage a network. For information about using these programs, see “Using the baseboard management controller” on page 88.

- **Remote Supervisor Adapter II SlimLine configuration**

  For information about setting up and cabling a Remote Supervisor Adapter II SlimLine, see the documentation that comes with the optional device.

- **Boot Menu program**

  The Boot Menu program is part of the BIOS. Use it to override the startup sequence that is set in the Configuration/Setup Utility program and temporarily assign a device to be first in the startup sequence.

Using the Configuration/Setup Utility program

Use the Configuration/Setup Utility program to perform the following tasks:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set and change passwords

- Set and change the startup characteristics of the server and the order of startup devices (startup-drive sequence)
- Set and change settings for advanced hardware features
- View and clear the error and event logs
- Resolve configuration conflicts

Starting the Configuration/Setup Utility program

To start the Configuration/Setup Utility program, complete the following steps:

1. Turn on the server.
2. When the prompt `Press F1 for Configuration/Setup` appears, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to access the full Configuration/Setup Utility menu. If you do not type the administrator password, a limited Configuration/Setup Utility menu is available.
3. Select the settings to view or change.

Configuration/Setup Utility menu choices

The following choices are on the Configuration/Setup Utility main menu. Depending on the version of the BIOS code, some menu choices might differ slightly from these descriptions.

- **System Summary**

  Select this choice to view configuration information, including the ID, speed, and cache size of the microprocessors, a USB device summary, and the amount of installed memory. When you make configuration changes through other options in the Configuration/Setup Utility program, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

  This choice is on the full and limited Configuration/Setup Utility menu.

- **System Information**

  Select this choice to view information about the server. When you make changes through other options in the Configuration/Setup Utility program, some of those changes are reflected in the system information; you cannot change settings directly in the system information.

  This choice is on the full Configuration/Setup Utility menu only.

  – **Product Data**

    Select this choice to view the machine type and model of the server, the serial number, the system UUID, the system board identifier, the revision level or issue date of the BIOS code and diagnostics code, and the version, date, and build level of ROM code for the Remote Supervisor Adapter II SlimLine, if one is installed.

  – **System card data**

    Select this choice to view the identity of the system board, power supplies, DASD backplane, and power backplane.

- **Devices and I/O Ports**

  Select this choice to view or change assignments for devices and input/output (I/O) ports. You can configure the serial ports, configure remote console redirection, enable or disable integrated Ethernet controllers, the SAS controller, IDE channels, and PCI slots, and view the system Ethernet MAC addresses. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device).

  This choice is on the full Configuration/Setup Utility menu only.

- **Date and Time**

  Select this choice to set the date and time in the server, in 24-hour format (*hour*:*minute*:*second*).

  This choice is on the full Configuration/Setup Utility menu only.

- **System Security**

  Select this choice to set passwords. See “Passwords” on page 84 for more information.

  This choice is on the full Configuration/Setup Utility menu only.

  – **Administrator Password**

    Select this choice to set or change an administrator password. An administrator password is intended to be used by a system administrator; it limits access to the full Configuration/Setup Utility menu. If an administrator password is set, the full Configuration/Setup Utility menu is available only if you type the administrator password at the password prompt. For more information, see “Administrator password” on page 85.

  – **Power-on Password**

    Select this choice to set or change a power-on password. See “Power-on password” on page 84 for more information.

- **Start Options**

  Select this choice to view or change the start options, including the startup sequence, keyboard NumLock state, PXE boot option, and PCI device boot priority. Changes in the start options take effect when you start the server.

  The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds. For example, you can define a startup sequence that checks for a disc in the CD-RW/DVD drive, then checks the hard disk drive, and then checks a network adapter.

  This choice is on the full Configuration/Setup Utility menu only.

- **Advanced Setup**

  Select this choice to change settings for advanced hardware features.

  Important: The server might malfunction if these options are incorrectly configured. Follow the instructions on the screen carefully.

  This choice is on the full Configuration/Setup Utility menu only.

  – **System Partition VIsibility**

    Select this choice to make the System Partition hidden or visible.

  – **Memory Settings**

    Select this choice to enable or disable pairs of memory connectors, configure the memory mode (flat, memory-mirroring, or online-spare), and view the memory speed.

– **CPU Options**

  Select this choice to specify the system cache type, and to enable or disable hyper-threading, the pre-fetch queue, and Virtualization Technology for all microprocessors in the server. Virtualization Technology enables the microprocessor to appear to be a dedicated processor to each running application in the system.

– **PCI Bus Control**

  Select this choice to view the system resources that are used by installed PCI (PCI Express or PCI-X) devices. You can change the master latency timer value, view and configure PCI interrupt routing, and enable or disable the loading and execution of ROM code per PCI slot (see message 1801 in the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD).

– **PCI Slot/Device Information**

  This choice is available only if an optional Remote Supervisor Adapter II SlimLine is installed.

  Select this choice to view the PCI device information, including PCI bus number, for each PCI slot. Highlight a slot; then, press Enter to view the details of the PCI devices that are connected to the slot. Follow the instructions on the screen to page forward or backward through the devices that are connected to the slot.

– **RSA II Settings**

  This choice is available only if an optional Remote Supervisor Adapter II SlimLine is installed

  Select this choice to configure the settings for the Remote Supervisor Adapter II SlimLine.

  - **MAC Address**
    This is a nonselectable item that displays the MAC address of the Remote Supervisor Adapter II SlimLine.
  - **DHCP IP Address**
    This is a nonselectable item that displays the current IP address of the Remote Supervisor Adapter II SlimLine.
  - **DHCP Control**
    Specify whether to use the static IP address or use DHCP to dynamically assign the IP address for the Remote Supervisor Adapter II SlimLine. If DHCP times out while it is assigning an IP address, the system defaults to the static IP address.
  - **Static IP Settings**

    Define the static IP address, subnet mask, and gateway address for the Remote Supervisor Adapter II SlimLine.
  - **OS USB selection**
    Select the operating system to use to provide USB support for remote access to the Remote Supervisor Adapter II SlimLine. The remote keyboard and mouse access the Remote Supervisor Adapter II SlimLine through a USB port. **Linux OS** is the default setting.

– **Baseboard Management Controller (BMC) setting**

  Select this choice to change settings for the BMC.

  - **BMC Firmware Version**
    This is a nonselectable menu item that displays the BMC firmware version.

- **BMC Build Level**
  This is a nonselectable menu item that displays the BMC firmware build level.
- **BMC Build Date**
  This is a nonselectable menu item that displays the BMC firmware build date.
- **BMC POST Watchdog**
  Enable or disable the BMC POST watchdog. **Disable** is the default setting.
- **BMC POST Watchdog Timeout**
  Set the BMC POST watchdog timeout value. **5 minutes** is the default setting.
- **System-BMC Serial Port Sharing**
  Enable or disable sharing the serial port between the BMC and the system. **Disabled** is the default setting; it assigns the serial port to the BMC exclusively.
- **BMC Serial Port Access Mode**
  If serial-port sharing is enabled, specify the times and conditions during which the BMC shares the serial port.
- **Reboot System on NMI**
  Enable or disable restarting the system whenever a nonmaskable interrupt (NMI) occurs. **Disabled** is the default.
- **BMC Network Configuration**
  View the BMC MAC address and the current BMC IP address. Define the static BMC IP address, subnet mask, and gateway address, and specify whether to use the static IP address or have DHCP assign the BMC IP address.
- **BMC System Event Log**
  Select this choice to view the BMC system event log, which contains messages about system events, such as devices inserted or removed or a threshold reached. Select **Clear BMC SEL** to clear the BMC system event log.
- **User Account Settings**
  Define user names and passwords for logging in to the BMC to remotely control settings on the server such as power settings.

• **Event/Error Logs**

  Select this choice to view and clear the POST error log and the system event/error log.

  – **Post Error Log**
    Select this choice to view the three most recent error codes and messages that were generated during POST. Select **Clear POST Error Log** to clear the POST error log.

  – **System Event/Error Log**

    This choice is available only if an optional Remote Supervisor Adapter II SlimLine is installed.

    Select this choice to view the error messages in the system event/error log. You can use the arrow keys to move between pages in the error log. Select **Clear System Event/Error Log** to clear the system event/error log.

    The system event/error log contains all event and error messages that have been generated during POST by the system management interface handler and by the system service processor. Run the diagnostic programs to get

more information about error codes that occur. See the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD for instructions for running the diagnostic programs.

- **Save Settings**

  Select this choice to save the changes that you have made in the settings.
- **Restore Settings**

  Select this choice to cancel the changes that you have made in the settings and restore the previous settings.
- **Load Default Settings**

  Select this choice to cancel the changes that you have made in the settings and restore the factory settings.
- **Exit Setup**

  Select this choice to exit from the Configuration/Setup Utility program. If you have not saved the changes that you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

Passwords

From the **System Security** choice, you can set, change, and delete a power-on password and an administrator password. The **System Security** choice is on the full Configuration/Setup menu only.

If you set only a power-on password, you must type the power-on password to complete the system startup; you have access to the full Configuration/Setup Utility menu.

An administrator password is intended to be used by a system administrator; it limits access to the full Configuration/Setup Utility menu. If you set only an administrator password, you do not have to type a password to complete the system startup, but you must type the administrator password to access the Configuration/Setup Utility menu.

If you set a power-on password for a user and an administrator password for a system administrator, you can type either password to complete the system startup. A system administrator who types the administrator password has access to the full Configuration/Setup Utility menu; the system administrator can give the user authority to set, change, and delete the power-on password. A user who types the power-on password has access to only the limited Configuration/Setup Utility menu; the user can set, change, and delete the power-on password, if the system administrator has given the user that authority.

Power-on password

If a power-on (user) password is set, when you turn on the server, the system startup will not be completed until you type the power-on password. You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the password.

If a power-on password is set, you can enable the Unattended Start mode, in which the keyboard and mouse remain locked but the operating system can start. You can unlock the keyboard and mouse by typing the power-on password.

If you forget the power-on password, you can regain access to the server in any of the following ways:

- If an administrator password is set, type the administrator password at the password prompt (see “Administrator password”). Start the Configuration/Setup Utility program and reset the power-on password.
- Remove the battery from the server and then reinstall it. For instructions for removing the battery, see the *Hardware Maintenance Manual* on the *ThinkServer Documentation* DVD.
- Change the position of the clear CMOS jumper on the system board to bypass the power-on password check. See “Resetting passwords” for additional information.

Important: Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. See the safety information that begins on page v. Do not change settings or move jumpers on any system-board switch or jumper block that is not shown in this document.
Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

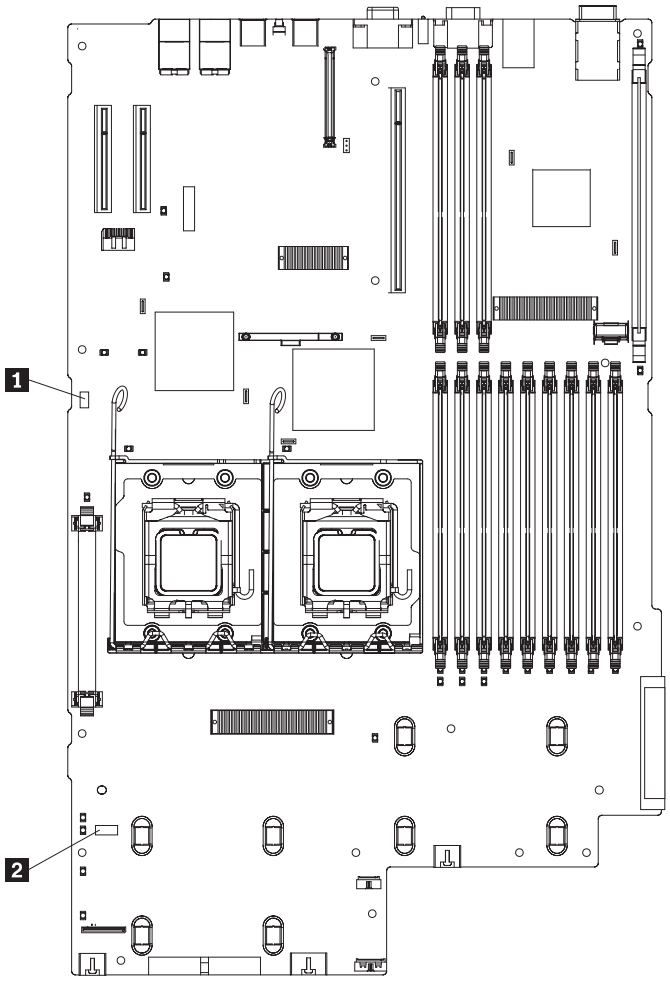
Administrator password

If an administrator password is set, you must type the administrator password for access to the full Configuration/Setup Utility menu. You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the password.

If you forget the administrator password, you can reset it after you change the position of the clear CMOS jumper. See “Resetting passwords” for additional information.

Resetting passwords

If you forget the user or administrator password, you can move the clear-CMOS switch on the system board to On, to clear CMOS memory and bypass the power-on or administrator password check. The clear-CMOS switch is switch 1 on switch block SW2. The switch location is shown in the following illustration.



1 Boot block recovery jumper (J42)
2 Switch block (SW2)

To clear CMOS and reset the passwords, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 29.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.
3. Remove the server from the rack and place it on a flat, static-protective surface.
4. Remove the cover. See “Removing the cover” on page 31 for instructions.
5. Move the clear-CMOS switch (switch 1 on SW2) to the On position.
6. Install the cover and connect the server to a keyboard, monitor, and mouse; then, connect the server to a power source.

Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.

7. Turn on the server. You can now start the Configuration/Setup Utility program and either delete the old password or set a new power-on or administrator password.
8. Save the configuration and turn off the server; then, disconnect all power cords and external cables again.

   Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.
9. Remove the cover, move the clear-CMOS switch back to the Off position, and reinstall the cover.
10. Replace the server in the rack and connect the external cables and power cords; then, turn on the server.

    Attention: In a dc power environment, only trained service personnel other than Lenovo service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.

Using the RAID Configuration Utility program

Use the RAID Configuration Utility programs to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- View or change the RAID configuration and associated devices

When you are using the RAID Configuration Utility programs to configure and manage arrays, consider the following information:

- Hard disk drive capacities affect how you create arrays. Drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.
- To update the firmware and BIOS code for an optional ServeRAID SAS controller, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID controller.

Starting the RAID Configuration Utility program

To start the IBM ServeRAID Configuration Utility program, complete the following steps:

1. Turn on the server.
2. When the prompt `<<< Press <CTRL><A> for IBM ServeRAID Configuration Utility! >>>` appears, press Ctrl+A. If you have set an administrator password, you are prompted to type the password.
3. To select a choice from the menu (see “RAID Configuration Utility menu choices” on page 88), use the arrow keys.
4. Use the arrow keys to select the channel for which you want to change settings.
5. To change the settings of the selected items, follow the instructions on the screen.

RAID Configuration Utility menu choices

The following choices are on the IBM ServeRAID Configuration Utility menu:

- **Array Configuration Utility**

  Select this choice to create, manage, or delete arrays, or to initialize drives.
- **Serial Select Utility**

  Select this choice to configure the controller interface definitions or to configure the physical transfer and SAS address of the selected drive.
- **Disk Utilities**

  Select this choice to format a disk or verify the disk media. Select a device from the list and read the instructions on the screen carefully before making a selection.

Configuring the controller

To configure a RAID array on the server, complete the following steps:

1. Turn on the server.
2. When the message `Press <CTRL><A> for IBM ServeRAID Configuration Utility` appears, press Ctrl+A.
3. Select **Array Configuration Utility**.
4. Select **Create Array**.
5. From the list of ready drives, select the drives that you want to group into the array.
6. From the list of RAID levels available, select the one you want to use, such as **RAID-1**.
7. (Optional) Type an identifier for the array.
8. When you are prompted for the array build method, select **Quick Init**.
9. Follow the instructions on the screen to complete the configuration; then, select **Done** to exit.
10. Restart the server.

Viewing the configuration

To view information about the RAID array, complete the following steps:

1. Turn on the server.
2. When the message `Press <CTRL><A> for IBM ServeRAID Configuration Utility` appears, press Ctrl+A.
3. Select **Array Configuration Utility**.
4. Select **Manage Arrays**.
5. Select an array and press Enter.
6. To exit from the program, press Esc.

Using the baseboard management controller

The baseboard management controller provides basic service-processor environmental monitoring functions for the server. If an environmental condition exceeds a threshold or if a system component fails, the baseboard management controller lights LEDs to help you diagnose the problem and also records the error in the BMC system event log.

Using the baseboard management controller utility programs

Use the baseboard management controller utility programs to configure the baseboard management controller, download firmware updates and sensor data record/field replaceable unit (SDR/FRU) updates, and remotely manage a network.

Using the baseboard management controller configuration utility program

Use the baseboard management controller configuration utility program to view or change the baseboard management controller configuration settings. You also can use the utility program to save the configuration to a file for use on multiple servers.

Note: You must attach an optional USB diskette drive to the server to run this program.

To start the baseboard management controller configuration utility program, complete the following steps:

1. Insert the configuration utility diskette into the diskette drive and restart the server.
2. From a command-line prompt, type `bmc_cfg` and press Enter.
3. Follow the instructions on the screen.

Using the baseboard management controller firmware update utility program

Use the baseboard management controller firmware update utility program to download and apply a baseboard management controller firmware update and SDR/FRU data update. The firmware update utility program updates the baseboard management controller firmware and SDR/FRU data only and does not affect any device drivers.

Note: To ensure proper server operation, be sure to update the server baseboard management controller firmware before you update the BIOS code.

To update the firmware, if the Linux or Windows® operating-system update package is available from the World Wide Web and you have obtained the applicable update package, follow the instructions that come with the update package.

Configuring the Gigabit Ethernet controllers

The Ethernet controllers are integrated on the system board. They provide an interface for connecting to a 10-Mbps, 100-Mbps, or 1-Gbps network and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet ports in the server support auto-negotiation, the controllers detect the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operate at that rate and mode.

You do not have to set any jumpers or configure the controllers. However, you must install a device driver to enable the operating system to address the controllers. For device drivers and information about configuring the Ethernet controllers, see the *Broadcom NetXtreme II Gigabit Ethernet Software* CD that comes with the server. To find updated information about configuring the controllers, go to the Lenovo Web site.

Appendix. Notices

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Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from Lenovo.

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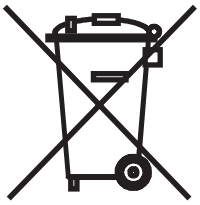

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Recycling statements for Japan

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Industry Canada Class A emission compliance statement

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Avis de conformité à la réglementation d'Industrie Canada

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Notice to Customers

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